Optronis
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User Manual
CamPerform-CycloneFiber Series

Rev:

CoaXPress over-Fiber

Camera shown with CY-FM

Document	1201-SU-01-A
Document Version	A
Release Date	05.02.2024
Language	English

About this manual

The purpose of this document is to provide a description of all Optronis CamPerform-CycloneFiber series cameras. Revision changes of camera hardware do not affect any safety-relevant functions or essential functional behavior described in this manual. Firmware version valid at the time of release of this document is used to describe the camera operation.

On the product page download area latest version of datasheet, manual, firmware and 3D data are available. For older cameras, contact Optronis in case firmware and manual versions valid at the time of procurement are needed. For those cameras, serial number of the camera needs to be indicated. to be sure you are using:

Please read this manual thoroughly before operating the camera. Follow all instructions and observe warnings. This document is subject to change without notice.

Support

We hope that this manual can answer your questions, but should you have any further questions or if you wish to claim a service or warranty case, please contact your local dealer or refer to the Optronis support. You can contact our support by using our website or by email at the following address: support@optronis.com . To process your request efficiently please prepare following information:

- Camera Model name: CycloneFiber-…. (See label at the bottom side of the camera).
- Serial-Number: 1201-X-XXX. (See label at the bottom side of the camera).
- Camera firmware version (4 numbers, ex: v2.32.2.123)
- Frame Grabber Model
- QFSP+ module type and FO-cable type
- Operating System (Windows 10/11/32bit/64bit …)
- Short description of the problem

Contacts

To contact us, please use the information below.

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1 Inhalt

2 General

2.1 Standards

The camera has been developed according to:

- CoaXPress Standard Version 2.1 - JIIA CXP-001-2021
- Optical interface Guideline for CoaXPress- JIIA CXPR-007-2020

2.2 Remarks

The following signs are used in this user manual to highlight some information:

Remarks and additional information.

Attention, warnings.

2.3 Scope of Delivery

The camera is delivered together with:

- Brief Introduction

For camera operation, power supply and typically one lens mount are needed.

Available accessories are:

- CY-CM C-Mount lens adapter
- CY-FM F-Mount lens adapter
- CY-M42 M42 Mount lens adapter
- CPH6-PTC Pig tail cable for synch
- CPH6-USB Programming Cable
- CY-FAN2 Cooling Fan

2.4 RoHS Compliance

CamPerform-CycloneFiber series cameras are Pb free manufactured.

3 Getting Started

3.1 Camera Handling

Please be careful when using camera. Pay attention especially to:

Temperature and Humidity	Please respect environmental conditions. You may use controlled airflow or active cooling to keep camera in better temperature conditions.
Dust and Cleaning	The camera is produced in a dust-controlled environment. Please be careful when changing lens, mount or accessing any part close to the sensor. See annex B for cleaning instructions.

Do not open the camera housing.
Warranty becomes void if the camera housing is opened.

3.2 Environmental Conditions

Environmental conditions are:

- Humidity: 20 … 80 % rel. Humidity, not condensing
- Altitude: see level up to 3,000 m (9,800 ft)
- Temperature: see table for each model

Optronis does not guaranty camera operation beyond above conditions and camera lifetime might be reduced.

3.2.1 Thermal conditions

CamPerform-CycloneFiber series cameras are available with accessories for heat dissipation. Depending on heat dissipating accessory, max. ambient temperature is given for each model on the technical data section. Fixing the camera on a heat conductive support can also be consider for heat dissipation. Measuring the case temperature might be necessary for critical applications to ensure the camera will not operate beyond its limits.

3.3 Camera Operation

Camera Power	Please be careful when powering camera. Use external power supply available at Optronis.

3.4 Setting Up System

3.4.1 CoaXPress-over Fiber Overview

CoaXPress-over-Fiber is a point-to-point interface to connect Devices (typically cameras) to Hosts (typically frame grabbers). It is strongly related to the CoaXPress standard interface and its protocol. Instead of using copper coaxial cables, fiber optical cables are used. Industry standard transceivers convert electrical to optical signals and vice versa. Key advantages of CoaXPress-over-Fiber is longer cable length and immunity against electro-magnetic radiation.

CycloneFiber-Series cameras provide a QSFP+ port to install QSFP+ modules. This allows bidirectional data transfer with very similar throughput as 4xCXP-12. The interface consists of a module installed on the QSFP+ port of the camera and a module on the frame grabber. Additionally, a fiber optical cable to connect to modules is needed. This interface allows:

- High speed serial (usually Device to Host down connection) at up to 41.25 Gbps.
- Low speed serial (usually Host to Device up connection) at up to 41.6 Mbps.

The link protocol defines the transfer of triggers, general purpose I/O, control data and high-speed streaming data over a link, as shown in the following figure.

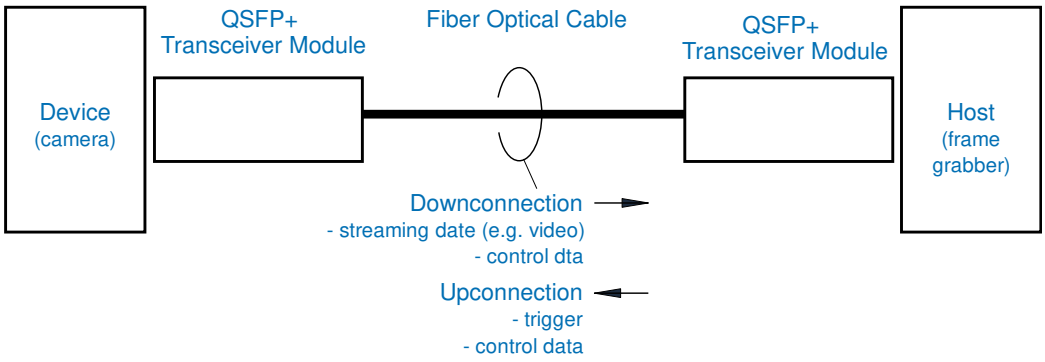


Figure 1: Configuration and data flow

3.4.2 Transceiver Module

To operate the CycloneFiber series cameras a transceiver module must be installed on the QSFP+ port and a fiber optical cable must connect the camera to a frame grabber with CoaXPress-over-Fiber interface. Table below shows typical configurations and max. cable lengths.

Transceiver Module	Manufacturer	Cable	Max. Cable Length
QSFP-40G-SR4	FS	12FMTPOM4	150 m
QSFP-LR4-40G-20	FS	SMLCDX	20 km

3.5 About Lenses

3.5.1 Lens handling

Please be careful when installing or removing camera lens. Depending on your lens mount type and lens, pay attention to following points:

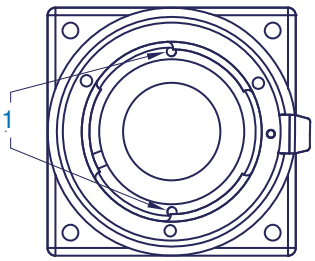
- If your lens has a F-mount flange, first align mounting mark camera mount to lens mounting marks and then rotate anti-clockwise to lock the lens. To remove the lens, unlock the lens-holder silver clip and rotate clockwise until marks are aligned. Then remove the lens.
- If your lens has a screw thread, rotate and clockwise for installation and rotate anti-clockwise to remove it.
- If you have removed the lens from the camera, always use a cap on the camera to avoid dust infiltration. Use also caps on both lens sides.
- Do not forget to remove the front cap of your lens before using the camera.

See Annex A for lens selection.

3.5.2 Lens Mount Exchange

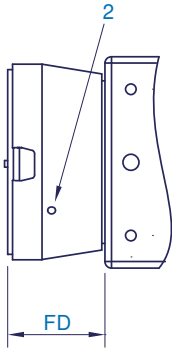
Lens mount of CamPerform-CycloneFiber cameras can be exchanged. Pay attention not to contaminate sensor or IR filter with dirt while working on the camera front section. Orient camera facing down to minimize this risk. After exchange, lens mount needs to be adjusted to obtain correct back focal length.

1. Remove the lens and loosen both M3 screws (1) with a 1.5 mm Allen key. Do not remove screws completely.

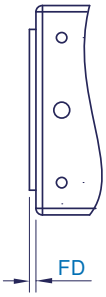


Example showing CY-FM mount, screw (1) position might be rotated.

2. Unscrew mount counterclockwise.
3. Screw in the mount clockwise to adjust flange distance (FD in mm) as shown on the table below. Tighten both screws (1).



Flange distance (FD) for CY-FM, CY-FMG



Flange distance (FD) for CY-CM

	Flange Distance (FD) to be adjusted		
Camera	**CY-CM**	**CY-FM / CY-FMG**	**CY-M42**
CycloneFiber-2-M	1.1	30.1	29.0
CycloneFiber-2-C	1.8	30.7	29.7
CycloneFiber-65-M	2.4	31.4	30.3
CycloneFiber-65-C	3.1	32.0	31.0
CycloneFiber-5-M	1.1	30.1	29.1
CycloneFiber-5-C	1.8	30.8	29.7
CycloneFiber-21-M	1.3	30.3	29.3
CycloneFiber-21-C	2.0	30.9	29.9

Hint: When tightening the screws (1), the flange distance increases slightly by ~0.1 mm. Therefore, prior to tighten screws flange distances can be ~0.1 mm less than shown on the table above.

4. Alternatively, to the mechanical measurement of flange distance, back focal distance of lens mount can be adjusted optically while camera is operating. Ideally, the lens finally used with the camera should be installed. Prior to tighten screws (1) install lens with open aperture and set focus to infinity. Direct lens on a far distant object and rotate lens together with mount until image is in focus. Remove lens and tighten screws (1).

5. For F-Mount (CY-FM and CY-FMG), release lever might be rotated with respect to the position shown above. In his case open 3 screws (2) by using a 1.5 mm Allen key and rotate front part. Tighten screws after this.

4 Camera Overview

4.1 General Description

4.1.1 Model Name Decoding

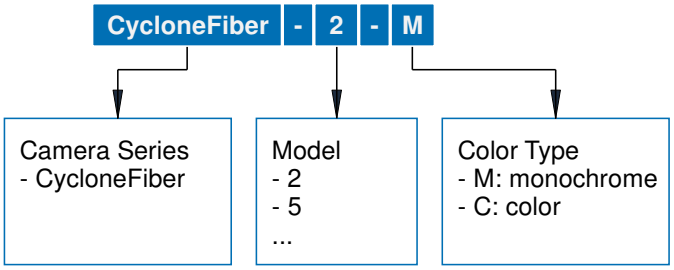


Figure 2: Camera model name

4.1.2 Camera Rear Side

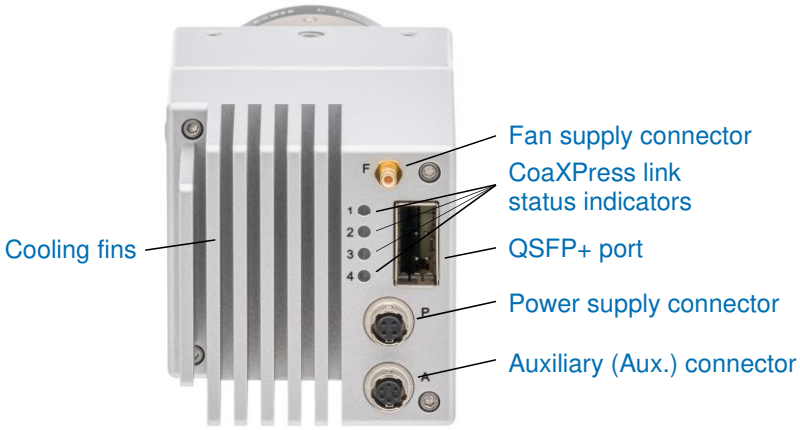


Figure 3: Camera rear side

4.1.3 Dimension with Accessories

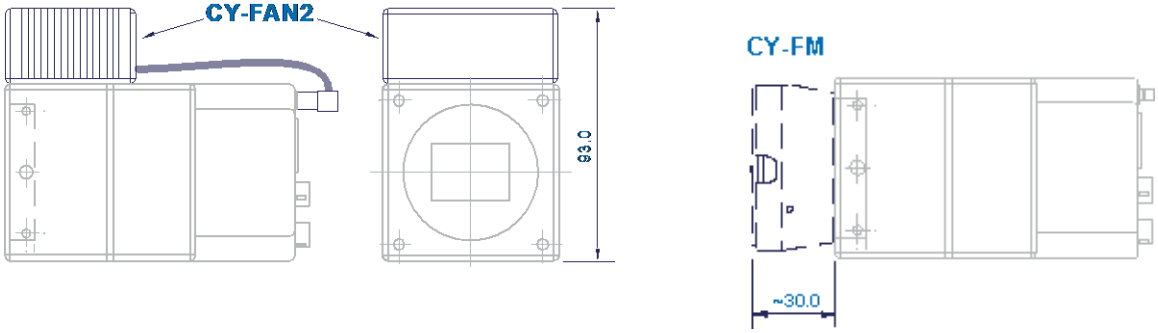


Figure 5: Dimensions fan (CY-FAN2) and mount (CY-FM)

4.1.4 Connection Status Decoding

Each CoaXPress connection has its dedicated LED indicating its status.

State	Indication
No power	Off
System booting	Solid orange
Powered, but nothing connected (not applicable to a device reliant on PoCXP power)	Flash_1 red
Connection detection in progress, PoCXP active	AlternateFlash_12_5 green / orange
Device / Host incompatible, PoCXP active	AlternateFlash_0_5 red / green
Device / Host connected, but no data being transferred	Solid green
Device / Host connected, waiting for event (e.g. trigger, exposure pulse)	Flash_1 orange
Device / Host connected; data being transferred	Flash_12_5 green
Error during data transfer (e.g. CRC error, single bit error detected)	500 ms red pulse
System error	Flash_12_5 red
Connection test packets being sent	AlternateFlash_0_5 green / orange
Firmware Update	Solid red

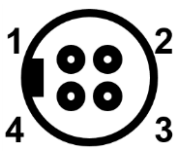
The connector indicator lamp timings are given in the following table:

Indication	Frequency (±20%)	Duty Cycle (on, ±20%)
Flash_1	1 Hz	25% (200 ms on, 800 ms off)
Flash_12_5	12.5 Hz	25% (20 ms on, 60 ms off)
AlternateFlash_12_5	12.5 Hz	25% (20 ms on color 1, 60 ms off, 20 ms on color 2, 60 ms off)
AlternateFlash_0_5	0.5 Hz	50% (1 s on color 1, 1 s off, 1 s on color 2, 1 s off etc)

4.1.5 External Power Supply Connector

The camera must be powered from the external power supply CPH4-PSA available as accessory. This unit is recommended. Alternatively, power can be provided by another supply unit as long bellow characteristics are respected:

Powering the camera via PoCXP in parallel to an external power supply via the “Power” connector is possible, but should be avoided.

Power Connector	
Camera connector type: ***Hirose HR10A-7R-4S*** Cable Connector type: ***Hirose HR10A-7P-4P***	
Connector View:  	
Connector Pinout	
Pin 1 and 2	+24 Volt ±5 %, (Ripple < 200 mV), >1.5 A
Pin 3 and 4	0V, Power Ground

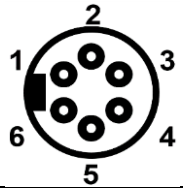
4.1.6 Fan Connector

Coaxial Fan connector can be used to power Optronis optional external fan. It can also be used to power your own cooling solution.

Fan Connector	
Camera connector type:	***Rosenberger 59S601-200L5***
Cable Connector type:	***Rosenberger 59K204-301L5***
Voltages	**+5 V, 250 mA max.**

4.1.7 Auxiliary Connector

Auxiliary connector is used to access camera Sync In and Sync Out IOs and for firmware updates. The connector is labelled “Aux.”. Camera accessory CPH6-PTC cable gives user 50 Ohm BNC connectors to access Sync IN and Sync Out signals. Camera accessory CPH6-USB cable allows an USB connection to a PC for firmware updates.

Auxiliary (Aux.) Connector	
Camera connector type:	***Hirose HR10A-7R-6S***
Cable Connector type:	***Hirose HR10A-7P-6P***
Connector View:	
Connector Pinout (galvanic separated)	
Pin 1	**Sync IN** External Synchronization Input. TTL level: < 0.8 Volt (low) > 2.0 Volt (high)
Pin 2	**Reserved**
Pin 3	**Sync Out** External Synchronization Output. TTL level @ high impedance, 0 to 2 Volt @ 50 Ohm.
Pin 4, 5 and 6	**0 V** Max. voltage difference between 0 V and GND (case): [-50 V ⇔ +50 V]

4.1.7.1 *Sync In*

The Synch In signal is used to precisely synchronize start of exposure. The term “Trigger” is used on the GenICam XML file to define how the Synch In signal is processed. The Sync In camera input accepts TTL signals. To operate Sync In correctly, a Sync In driver must be used with a minimum sink current (TTL low level) of 5 mA. Alternatively, it can be driven from a 50 Ohm output if a long cable is used. In this case the cable might need to be terminated by adding an external 50 Ohm resistor near to the camera input.

Pulse width: min. 200 ns

Sync In input voltage limits are: [-5 V ⇔ +30 V]
Voltages beyond these limits may damage camera.

Sync In signal is referred to 0 V of pins 4, 5, and 6. This 0 V signal is floating with respect to GND and case. Difference between 0 V and case must not exceed ±50 V.

A transistor working in open collector configuration can be used as easy solution to drive this input

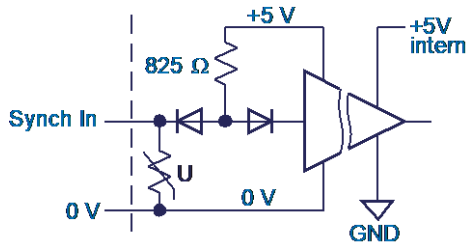


Figure 6: Synch In schematics

4.1.7.2 *Sync Out*

The Synch Out can be used to synchronize external strobe light to the exposure time of the sensor. Voltage output is 0 V (low level) to ~2 V (high level) when driving a 50 Ohm load. At high impedance termination, the driver voltage is 0 V (low level) to ~4 V (high level).

Polarity: Depending on SyncOutEnable and SyncOutPolarity settings.
Pulse width: Following sensor exposure time

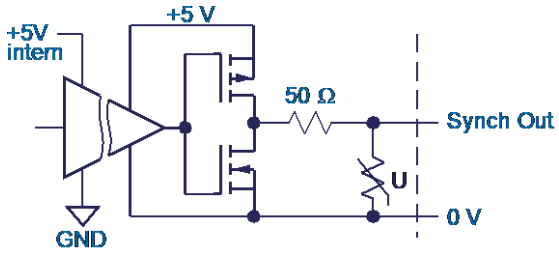
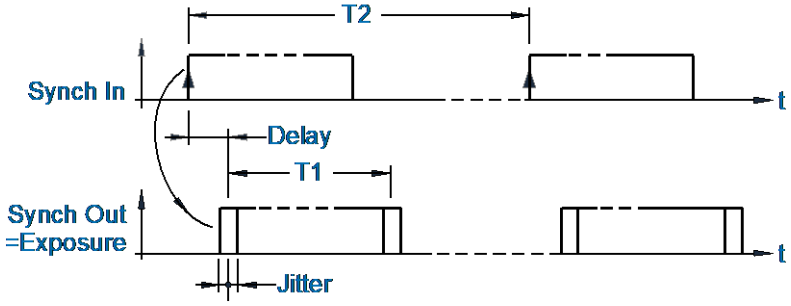


Figure 7: Synch Out schematics

Sync Out signal is referred to 0 V of pins 4, 5, and 6. The 0 V signal is floating with respect to GND and case. Difference between 0 V and case must not exceed ±50 V.

4.1.7.3 *Delay and Jitter*

Timing shows relation between Synch In signal and exposure time. Camera is set to
AcquisitionMode="SingleFrame"
ExposureMode="TriggerWidth"



Definition	Conditions
T1: Exposure Time	T1 min = defined by min . exposure of each model T1 max = T2 – T1 min - Delay
T2: Frame Interval (= 1 / Frame Rate)	T2 min = 1 / (max. Frame Rate) T2 max = 1 / (min. Frame Rate)

Model	Delay	Jitter
CycloneFiber-2	1.306 µs	±856 ns
CycloneFiber-5	1.239 µs	±760 ns
CycloneFiber-21	8.200 µs	±70 ns
CycloneFiber-65	4.388 µs	±76 ns

Values above are given for camera operation at full resolution. Width of frame will affect delay and jitter values.

Example: for CycloneFiber-5, delay is 1239 ns +/- 760ns, meaning time between rising edge of external Sync In and exposure output (Sync Out) can vary from 479 ns to 1.999 µs

Special case:
For CycloneFiber-65 with activated “TriggerWidth” mode, camera adds an extra-time to the exposure time (sensor related). That means the external pulse width must be shorter than the required exposure time.

Model	Extra-Time added to pulse width in TriggerWidth mode
CycloneFiber-65	11.87 µs

For example, with a CycloneFiber-65 operated in “TriggerWidth” mode, to achieve an exposure time of EXP, the pulse width is EXP-11.87 µs.

4.1.7.4 *Synch frequency restrictions*

Trigger signal applied to the Synch In input to synchronize frame exposure must respect timing limitations. If this is not fulfilled, it will result in unexpected behavior. This might be a missing frame with respect to the trigger signal or extended exposure time.

1. Trigger frequency must remain below 1/ExposureTime and below max. frame rate for the given resolution.
2. Trigger frequency must be higher than min. frame rate.
3. If camera is operated with ExposureMode=TriggerWidth, end of exposure must NOT appear before camera readout is completed.

4.2 Technical Data

Camera power indication is including a QSFP+ module with max. 1.5 W power consumption. Using modules with different power requirements will result in different power consumption for the camera and will impact maximum ambient temperature.

4.2.1 CycloneFiber-2

Parameter	CycloneFiber-2
Image sensor	LUX19HS Global Shutter CMOS
Sensor resolution	1920 x 1080
Width inc,min,max	64, 256, 1920
Height inc,min,max	4, 4, 1080
Framerate @ max. sensor resolution	2,166 fps
Framerate min	20 fps
Frame rate increase	in Y
Exposure Time min,max (in µs)	2, 1/framerate
Active Area	19.2 mm x 10.80 mm
Sensor diagonal dimension	22.03 mm
Pixel size	10.0 µm
A/D conversion	8 bit / 10 bit
Trigger signal (Sync In, Sync Out)	TTL, 3.3 - 5 V, 10 mA, optically isolated
Trigger modes	Internal free-run, external, CXP
Interface	QSFP+ port
Power	11.5 W
Lens mount	F-Mount, C-Mount, M42 and custom
Weight	540 g without mount
Dimensions	65 mm x 65 mm x 107 mm
Housing	lightweight anodized aluminum
Factory hot pixel correction	Yes
System Gain*	60 e^-/DN
Temporal dark noise*	22 e^-
Signal-to-Noise Ratio*	41 dB
Absolute sensitivity threshold*	29 e^-
Saturation Capacity*	13,000 e^-
Dynamic Range*	53 dB
DSNU*	40 e^-
PRNU*	1.8%
Linearity error (LE,EMVA1288_v3.0)*	2%
DualROI**	Yes, up to 2 ROIs
LineSkipping** (only for monochrom sensor)	No
Pattern**	Yes
User Hot Pixel Correction	Yes
User column-based Offset Correction**	Yes
User column-based Gain Correction**	Yes
Counter information in frame**	Yes
Horizontal mirroring** (only for monochrome sensor)	No
Vertical mirroring** (only for monochrome sensor)	No
User global analog offset**	Yes
User global analog gain**	Yes
Save setup to flash and load on power-on**	Yes
Digital Binning 2x2** (only for monochrome sensor)	Yes
RGB Gain **	Yes
Exposure modes	Timed

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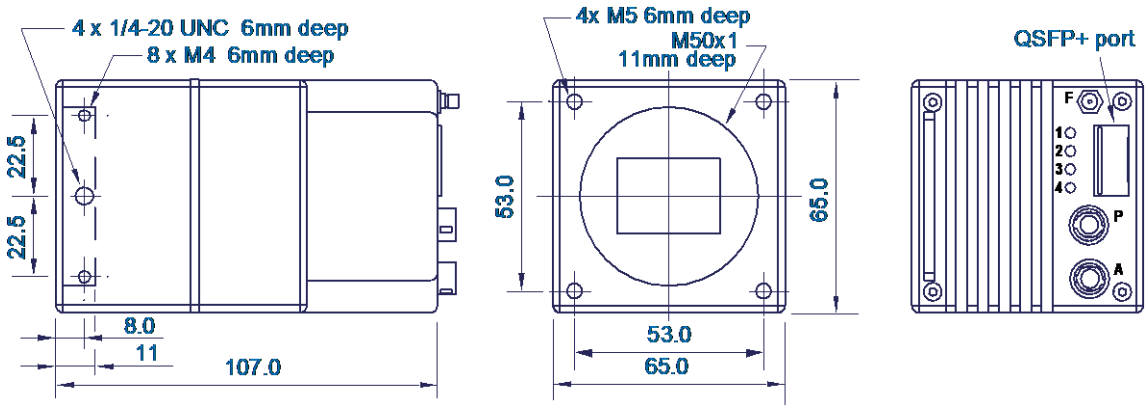
** A frame rate calculator is available at https://optronis.com/calculator/

Important:

1) StreamPacketSizeMax set by frame-grabber must be ≥2,544 Bytes. Flexible handling of StreamPacketSize is not implemented.

Ambient Temperatures CycloneFiber-2 during operation	
Case only	0 .. +35°C / 32 .. 95°F
CY-FAN2	0 .. +50°C / 32 .. 122°F
Case Temperature	0 .. +70°C / 32 .. 158°F



4.2.2 CycloneFiber-5

Parameter	CycloneFiber-5
Image sensor	LUX51 Global Shutter CMOS
Sensor resolution	2560 x 1916
Width inc., min, max	64, 256, 2560
Height inc., min, max	4, 4, 1916
Framerate @ max. sensor resolution	693 fps
Framerate min	20 fps
Frame rate increase	in Y
Exposure Time min, max	4 µs, 1/framerate
Active Area	12.80 mm x 9.580 mm
Sensor diagonal dimension	16.00 mm
Pixel size	5.0 µm
A/D conversion	8 bit / 10 bit
Trigger signal (Sync In, Sync Out)	TTL, 3.3 - 5 V, 10 mA, optically isolated
Trigger modes	Internal free-run, external, CXP
Interface	QSFP+ port
Power	10 W
Lens mount	F-Mount, C-Mount, M42 and custom
Weight	540 g without mount,without fan
Dimensions	65 mm x 65 mm x 107 mm
Housing	lightweight anodized aluminum
Factory hot pixel correction	Yes
System Gain*	52 e^-/DN
Temporal dark noise*	21 e^-
Signal-to-Noise Ratio*	41 dB
Absolute sensitivity threshold*	22 e-
Saturation Capacity*	12,000 e^-
Dynamic Range*	55 dB
DSNU*	75 e^-
PRNU*	2.3%
Linearity error (LE,EMVA1288_v3.0)*	1.2%
DualROI**	Yes, up to 2 ROIs
LineSkipping** (only for monochrome sensor)	Yes
Pattern**	Yes
User Hot Pixel Correction	Yes
User column-based Offset Correction**	Yes
User column-based Gain Correction**	Yes
Counter information in frame**	Yes
Horizontal mirroring** (only for monochrome sensor)	No
Vertical mirroring** (only for monochrome sensor)	No
User global analog offset**	Yes
User global analog gain**	Yes
Save setup to flash and load on power-on**	Yes
Digital Binning 2x2** (only for monochrome sensor)	Yes
RGB Gain **	Yes
Exposure modes	Timed

* EMVA 1288

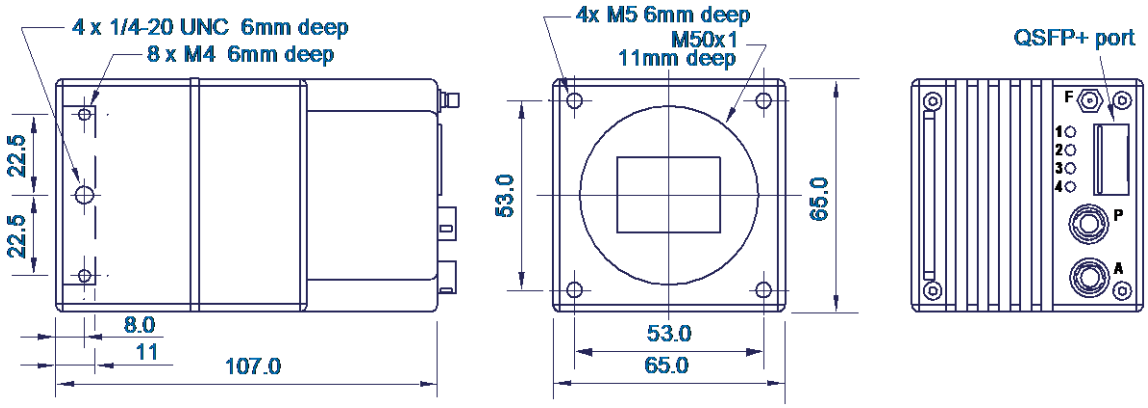
** Optronis features

** A frame rate calculator is available at https://optronis.com/calculator/

Important:

1) StreamPacketSizeMax set by frame-grabber must be ≥3,344 Bytes. Flexible handling of StreamPacketSize is not implemented.

Ambient Temperatures CycloneFiber-5 during operation	
Case only	0 .. +45°C / 32 .. 113°F
CY-FAN2	0 .. +55°C / 32 .. 131°F
Case Temperature	0 .. +70°C / 32 .. 158°F



4.2.3 CycloneFiber-65

Parameter	CycloneFiber-65
Image sensor	GMAX3265 Global Shutter CMOS
Sensor resolution	9344 x 7000
Width inc, min, max	64, 256, 9344
Height inc, min, max	4, 4, 7000
Framerate @ max. sensor resolution	71 fps
Framerate min	1 fps
Frame rate increase	in Y
Exposure Time min, max	12 µs, 1/framerate
Active Area	29.90 mm x 22.40 mm
Sensor diagonal dimension	37.36 mm
Pixel size	3.2 um
A/D conversion	8 bit / 10 bit
Trigger signal (Sync In, Sync Out)	TTL, 3.3 - 5 V, 10 mA, optically isolated
Trigger modes	Internal free-run, external, CXP
Interface	QSFP+ port
Power	16 W
Lens mount	F-Mount, C-Mount, M42 and custom
Weight	540 g without mount
Dimensions	65 mm x 65 mm x 107 mm
Housing	lightweight anodized aluminum
Factory hot pixel correction	Yes
System Gain*	46 e^-/DN
Temporal dark noise*	18 e^-
Signal-to-Noise Ratio*	40 dB
Absolute sensitivity threshold*	15 e^-
Saturation Capacity*	10,500 e^-
Dynamic Range*	57 dB
DSNU*	58 e^-
PRNU*	2%
Linearity error (LE,EMVA1288_v3.0)*	0.3%
DualROI**	Yes, up to 2 ROIs
LineSkipping** (only for monochrome sensor)	Yes
Pattern**	Yes
User Hot Pixel Correction	Yes
User column-based Offset Correction**	Yes
User column-based Gain Correction**	Yes
Counter information in frame**	Yes
Horizontal mirroring** (only for monochrome sensor)	No
Vertical mirroring** (only for monochrome sensor)	No
User global analog offset**	Yes
User global analog gain**	Yes
Save setup to flash and load on power-on**	Yes
Digital Binning 2x2** (only for monochrom sensor)	Yes
RGB Gain **	Yes
Exposure modes	Timed and TriggerWidth

* EMVA 1288

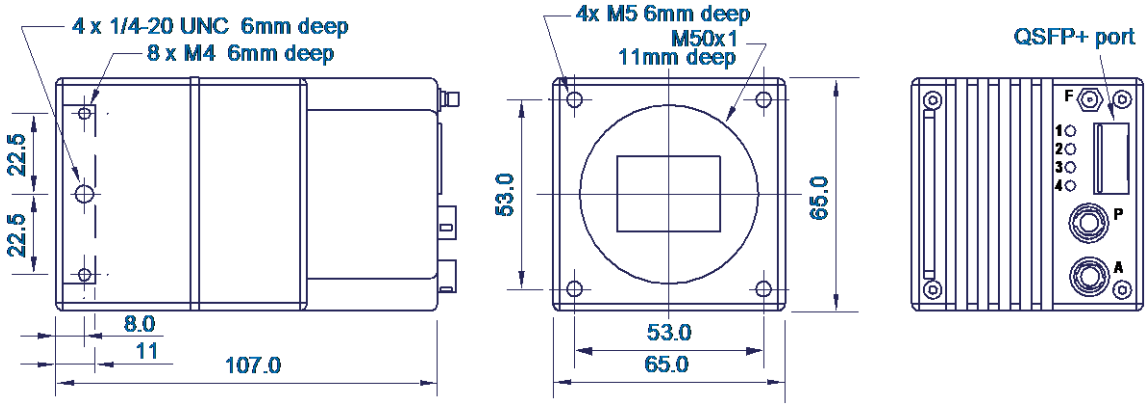
** Optronis features

** A frame rate calculator is available at https://optronis.com/calculator/

Important:

1) StreamPacketSizeMax set by frame-grabber must be ≥11,824 Byte. 16 kByte is recommended to reach maximal framerates, flexible handling of StreamPacketSize is not implemented.

Ambient Temperatures CycloneFiber-65 during operation	
Case only	0 .. +25°C / 32 .. 77°F
CY-FAN2	0 .. +45°C / 32 .. 113°F
Case Temperature	0 .. +60°C / 32 .. 140°F



4.2.4 CycloneFiber-21

Parameter	CycloneFiber-21
Image sensor	GSPRINT4521 Global Shutter CMOS
Sensor resolution	5120 x 4096
Width inc, min, max	64, 256, 5120
Height inc, min, max	32, 32, 4096
Framerate @ max. sensor resolution	230
Framerate min	1 fps
Frame rate increase	in Y
Exposure Time min, max	4 µs, 1/framerate
Active Area	23.04 mm x 18.43 mm
Sensor diagonal dimension	29.50 mm
Pixel size	4.5 um
A/D conversion	8 bit / 10 bit
Trigger signal (Sync In, Sync Out)	TTL, 3.3 - 5 V, 10 mA, optically isolated
Trigger modes	Internal free-run, external, CXP
Interface	QSFP+ port
Device Tap Geometry	1X-2YE
Power	23 W
Lens mount	F-Mount, C-Mount, M42 and custom
Weight	560 g without mount
Dimensions	65 mm x 65 mm x 109 mm
Housing	lightweight anodized aluminum
Factory hot pixel correction	Yes
EMVA1288 measurements typ. v3.1 / 10 bit	
System Gain*	31 e^-/DN
Temporal dark noise*	35 e^-
Signal-to-Noise Ratio*	45 dB
Absolute sensitivity threshold*	38 e^-
Saturation Capacity*	31,000 e^-
Dynamic Range*	59 dB
DSNU*	18 e^-
PRNU*	1.6%
Linearity error (LEmin,LEmax)*	<4%
Linearity error (LE, EMVA1288_v3.0)*	0.5%
DualROI**	No
LineSkipping** (only for monochrome sensor)	No
Pattern**	Yes
User Hot Pixel Correction	Yes
User column-based Offset Correction**	Yes
User column-based Gain Correction**	Yes
Counter information in frame**	Yes
Horizontal mirroring** (only for monochrome sensor)	No
Vertical mirroring** (only for monochrome sensor)	No
User global analog offset**	Yes
User global analog gain**	Yes
Save setup to flash and load on power-on**	Yes
Digital Binning 2x2** (only for monochrome sensor)	No
RGB Gain **	Yes
Exposure modes	Timed and TriggerWidth

* EMVA 1288

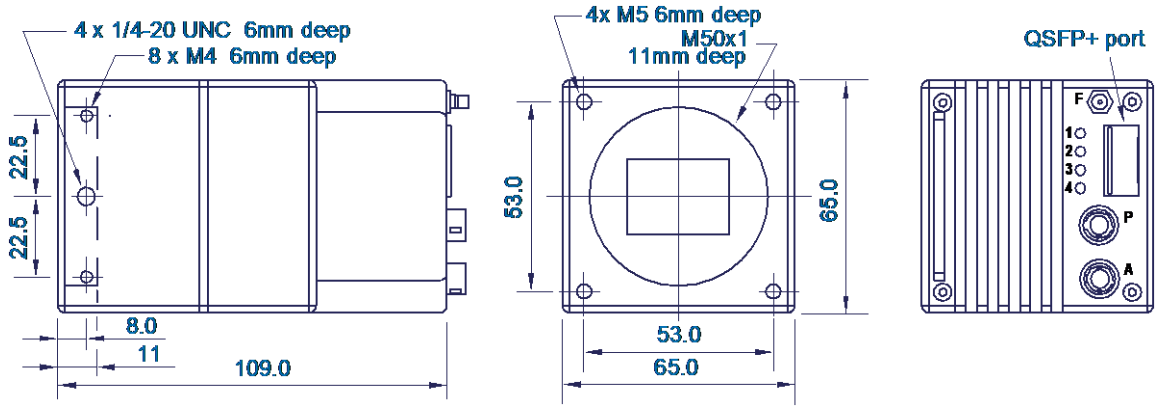
** Optronis features

** A frame rate calculator is available at https://optronis.com/calculator/

Important:

1) StreamPacketSizeMax set by frame-grabber must be ≥6,544 Byte. Flexible handling of StreamPacketSize is not implemented.
2) The ROI height can be adjusted in the CycloneFiber-21, but be aware that vertical offset cannot be set. ROI is always vertically centered.
3) The frame-grabber used in association with the CycloneFiber-21 must support the CoaXPress 1X-2YE DeviceTapGeometry.

Ambient Temperatures CycloneFiber-21 during operation	
Case only	0 .. +15°C / 32 .. 59°F
CY-FAN2	0 .. +35°C / 32 .. 95°F
Case Temperature	0 .. +60°C / 32 .. 140°F



5 Camera Control Interface

Camera is controlled through a standard GenICam XML file. For *DeviceControl*, *TransportLayerControl*, *Support* and *CXP* sections, please refer to the CoaXPress Version 2.1 specification. Description below refers to the firmware version programmed at the time this manual was the latest. Contact Optronis to verify whether firmware version programmed in the camera and version of this manual are consistent.

5.1 ImageFormatControl

XML entry name address	Description
WidthMax	Maximum width (in pixels) of the image. The dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.
HeightMax	Maximum height (in pixels) of the image. This dimension is calculated after vertical binning, decimation or any other function changing the vertical dimension of the image.
Width	Represents the actual image width expelled by the camera (in pixels).
Height	Represents the actual image height expelled by the camera (in pixels).
OffsetX	Horizontal offset from the origin to the area of interest (in pixels).
OffsetY	Vertical offset from the origin to the area of interest (in pixels).
PixelFormat	Indicates the format of the pixel to use during the acquisition. Mono10 uses packed data and corresponds to GenICam Mono10Packed.

5.2 AcquisitionControl

XML entry name address	Description
AcquisitionMode	Controls the acquisition mode of the device. • Continuous: Internal triggering (free running) • SingleFrame: External trigger signal (Synch In) • CoaXPress: Trigger over CXP
AcquisitionStart	Starts the Acquisition of the device. Check that ImageHeightValid is set to 1 before starting. If ImageHeightValid is 0, that means that the transferred frame height is not a multiple of 4, and in that case, acquisition will not start.
AcquisitionStop	Stops the Acquisition of the device at the end of the current Frame.
AcquisitionFrameRate	Frame rate in Hz.
ExposureTime	Sets the Exposure time (in microseconds) when ExposureMode is Timed. This controls the duration where the photosensitive cells are exposed to light.
ExposureMode	Sets the Exposure mode. • Timed: Exposure time is defined by ExposureTime entry • TriggerWidth: Exposure time is defined by external or CXP trigger pulse width. - Width might be positive or negative width of Synch In signal depending on whether rising or falling edge is defined to trigger the start of exposure. - TriggerWidth is not available for all camera models. Please refer to section 4.2 for more details about your camera model.

The camera frame acquisition is controlled by using camera XML AcquisitionStart and AcquisitionStop commands.

The camera frame acquisition can be synchronized by 3 different ways:

- **Camera Internal Generator:** (*AcquisitionMode* = “Continuous”)

In this mode, the camera uses its own sync generator and generates frames continuously when acquisition is started. Frames are generated according to *AcquisitionFrameRate* value.

- **External Synchronization Generator:** (*AcquisitionMode* = "Single Frame")

In this mode, the camera uses an external signal to generate frames. You must apply a TTL signal the Sync In input of the camera. Please respect signal limits (current and voltage) and use the Aux. to BNC adapter or respect Aux. connector pinout.

- **Synchronization over CoaXPress by Frame Grabber:** (*AcquisitionMode* = "CoaxPress")

CoaXPress standard allows Frame Grabber synchronizing camera frame generation using specific packets called *trigger packets* sent on "CoaXPress uplink".

5.3 Optronis

XML entry name address	Description
IndicatorLamps	Enables or disables indicator lamps.
EnableFan	Enables or disables camera Fan power output. Fan can be disabled during frame acquisition to avoid vibrations and enabled to stabilize temperature when not capturing frames.
ColorSensor	Indicates if camera has camera a color sensor. '0' means mono sensor. '1' means color sensor.
Pattern	Enables or disables a frame Pattern. When disabled, sensor pixels are sent. Pattern is a diagonal pattern and has following format: Line 0: 0, 1, 2,..,255, 0, 1, 2,..,255,… Line 1: 1, 2, 3,.., 255, 0, 1, 2, .., 255,… … Line N: N,N+1,N+2,..,255, 0,1,2,..,255,…
Binning	Enables or disables digital binning 2x2. If set to 'On', binning is activated. If set to 'Off', binning is disactivated.
Flipping	Sets the Flipping (or Mirroring) mode. If set to 'Off', no flipping is applied to the camera. If set to 'Horizontal', horizontal flipping is applied to the camera. If set to 'Vertical', vertical flipping is applied to the camera. If set to 'Horizontal_And_Vertical', horizontal AND vertical flipping are applied to the camera.
LineSkipping	Enables or disables line skipping feature. If dual ROI mode is used, it can be applied on all ROIs ("On") on only a specific ROI ("ROI1_Only" or "ROI2_Only")
DualROI	Enables or disables dual ROI mode.
Height_ROI1	Height of ROI1 when dual ROI mode is enabled.
Height_ROI2	Height of ROI2 when dual ROI mode is enabled.
ROI1_OffsetY	Offset of ROI1 when dual ROI mode is enabled.
ROI2_OffsetY	Offset of ROI2 when dual ROI mode is enabled.
ImageHeightValid	Indicates if output frame height is valid with current setup (Binning, dual ROI, line skipping are impacting this result).
DefectPixelCorrectionEnable	Enables or disables defect pixel correction.
DefectPixelTestMode	When enabled, this test mode eases defect pixel coordinates by showing corrected pixels in white and non-corrected pixels in black.
DefectPixelSource	Returns the source of defect pixel correction (Factory programmed or User saved).
DefectPixelTotal	Returns the number of corrected pixels in the frame.
DefectPixelLineSelect	For CycloneFiber-5 and CycloneFiber-2 DefectPixelLineSelect selects a defect pixel list to display or modify for a physical sensor line of ordinate DefectPixelLineSelect.

	For CycloneFiber-65, DefectPixelLineSelect selects a defect pixel list to display or modify for two physical sensor line of ordinate 2*DefectPixelLineSelect and 1+2*DefectPixelLineSelect.
DefectPixelX0 DefectPixelX1 DefectPixelX2 DefectPixelX3 DefectPixelX4 DefectPixelX5 DefectPixelX6 DefectPixelX7	For CycloneFiber-5 and CycloneFiber-2 DefectPixelXi is the absciss of the defect pixel Pi(DefectPixelXi, DefectPixelLineSelect). For CycloneFiber-65 DefectPixelXi is the absciss of the defect pixel Pi(DefectPixelXi, 2*DefectPixelLineSelect) if i is in the range [0..3] and the absciss of the defect pixel Pi(DefectPixelXi, 1+2*DefectPixelLineSelect) if i is in the range [4..7] Set DefectPixelXi = 0xFFFF to disable correction for pixel Pi. Set DefectPixelXi = [0 .. ImageWidth-1] to enable correction for pixel Pi. It modifies only RAM value. Call DefectPixelUserFlashSave() to save current defect pixel configuration.
DefectPixelClearAll	Clears all RAM values (0xFFFF) and set DefectPixelTotal to '0'. Flash data is not impacted. If camera is power cycled, the same flash configuration will be loaded again.
DefectPixelUserFlashSave	Saves current RAM values to User flash area. Previous user values in flash are lost. Current values will be used at next power cycle.
DefectPixelUserFlashErase	Erases current user flash values. Previous user values in flash are lost. No user correction will be loaded after a power cycle until new values are saved using DefectPixelUserFlashSave.
Correction	Enables or disables FFC correction.
Correction_Coeff_X	Selects a column **X** in the frame (0 … Width_Max-1).
Correction_Coeff_V	FPN & PRNU Coefficients of column **X** = Correction_Coeff_X. 16b integer with: - Bit8..0 = PRNU_Coeff (valid values are 0..511) - Bit15..9 = FPN_Coeff (valid values are 0..127) Ex: Correction_Coeff_X = 50 & Correction_Coeff_V = 0x0280. It means that for column n° 50: - FPN_Coeff(column=50) = 0x1 PRNU_Coeff(column=50) = 0x80 (PRNU_coeff/128=1)
Correction_UserGD	UserGD offset value of selected column **X** = Correction_Coeff_X.
Correction_DMean	DMean offset value of selected column **X** = Correction_Coeff_X.
FFCSaveToFlash	Saves current FFC parameters from RAM to flash. Erases previous user FFC correction. This new saved FFC correction will be used after next power cycle.
CXP_Trigger_Period	Reference period (in µs) used to detect missing trigger packets.
CXP_Trigger_Counter_Error	Returns the number of missing trigger packets. This counter is incremented until reset by XML entry CXP_Trigger_Counter_Reset.
CXP_Trigger_Counter_Reset	Resets CXP_Trigger_Counter_Error counters.
Temperature	Returns camera internal temperature.
MaxFrameRateExtended	If set to "Default", the calculation of the maximal frame rate is based on sensor size. If set to "Extended", the calculation of the maximal frame rate is based on exposure time (approximately 1/exposure time)
AGain	Analog gain
AOffset	Analog offset applied to the sensor in mV
DGain	Digital gain Set value between 0 and 16383 with steps of 1, corresponding to floating gains between 0 and 16383/1024 with steps of 1/1024. A value of 1024 corresponds to a gain of 1.0
DOffset	Digital offset between 0 and 1023. When using 8 bits pixel format, image offset is increased by DOffset/4. When using 10 bits pixel format, image offset is increased by DOffset.

CounterInformation	If enabled, the first pixels of the image will contain the following information: a 16-bits image counter and 24-bits microsecond counter, a trigger counter (counter that increments as soon as the camera has validated an incoming external trigger), OffsetX and OffsetY. a) In 8bits-mode: Pixel 0 contains bits 15..8 of the image counter Pixel 1 contains bits 7..0 of the image counter Pixel 2 contains bits 23..16 of the microsecond counter Pixel 3 contains bits 15..8 of the microsecond counter Pixel 4 contains bits 7..0 of the microsecond counter Pixel 5 contains bits 15..8 of the trigger counter Pixel 6 contains bits 7..0 of the trigger counter Pixel 7 contains bits 15..8 of the horizontal offset OffsetX Pixel 8 contains bits 7..0 of the horizontal offset OffsetX Pixel 9 contains bits 15..8 of the vertical offset OffsetY Pixel 10 contains bits 7..0 of the vertical offset OffsetY a) In 10bits-mode: Pixel 0 contains bits 15..6 of the image counter Pixel 1 contains bits 5..0 of the image counter and bits 23..20 of the microsecond counter Pixel 2 contains bits 19..10 of the microsecond counter Pixel 3 contains bits 9..0 of the microsecond counter Pixel 4 contains bits 15..6 of the trigger counter Pixel 5 contains bits 5..0 of the trigger counter and bits 15..12 of the horizontal offset OffsetX Pixel 6 contains bits 11..2 of the horizontal offset OffsetX Pixel 7 contains bits 1..0 of the horizontal offset OffsetX and bits 15..8 of the vertical offset OffsetY Pixel 8 contains bits 7..0 of the vertical offset OffsetY and 2 bits to '0'.
RGB_Gain_Enable	Only available for color cameras. Activates separate gains for red (RGB_Gain_R), green (RGB_Gain_G) and blue (RGB_Gain_B) pixels on color sensors. Set to "On" to activate, "Off" to disactivate.
RGB_Gain_R	Only available for color cameras. Gain for red pixels. Set value between 0 and 4095 with steps of 1, corresponding to floating gains between 0 and 4095/1024 with steps of 1/1024. A value of 1024 corresponds to a gain of 1.0
RGB_Gain_G	Only available for color cameras. Gain for green pixels. Set value between 0 and 4095 with steps of 1, corresponding to floating gains between 0 and 4095/1024 with steps of 1/1024. A value of 1024 corresponds to a gain of 1.0
RGB_Gain_B	Only available for color cameras. Gain for blue pixels. Set value between 0 and 4095 with steps of 1, corresponding to floating gains between 0 and 4095/1024 with steps of 1/1024. A value of 1024 corresponds to a gain of 1.0
BalanceWhiteAuto_Highlight	Highligths the ROI used by BalanceWhiteAuto.
BalanceWhiteAuto_OffsetX	Horizontal offset from the origin to the area of interest (in pixels) used for white balance.
BalanceWhiteAuto_OffsetY	Vertical offset from the origin to the area of interest (in pixels) used for white balance.
BalanceWhiteAuto_Width	Width of the area of interest (in pixels) used for white balance.
BalanceWhiteAuto_Height	Height of the area of interest (in pixels) used for white balance.
BalanceWhiteReset	Reset all RGB_Gain_x to 1024.
BalanceWhiteAuto	Controls the mode for automatic white balancing between the color channels. The white balancing ratios are automatically adjusted. Possible values are: • Off: White balancing is user controlled using RGB_Gain_x and RGB_Gain_Enable. • Once: White balancing is automatically adjusted once by the device. Once it has converged, it automatically returns to the Off state. • Continuous: White balancing is constantly adjusted by the device.
SyncOutEnable	Defines the way the camera output Sync Out is generated.

	When set to 'AlwaysOn', Sync Out is pulsing if acquisition is stopped or not. In that case, Sync Out is active during the exposure time of the sensor. When set to 'AlwaysOff', Sync Out is set to low level (0 V). When set to 'OnAcquisitionOnly' and acquisition stated, Sync Out follows exposure when the sensor is capturing light. When acquisition is stopped, Sync Out is set to low level (0 V).
SyncOutPolarity	Defines the polarity of the Sync Out signal during exposure time of the sensor. When set to 'High', Sync Out is high during the exposure time of the sensor and low when the sensor is not sensitive. When set to 'Low', Sync Out is low during the exposure time and high when there is no exposure.
Hold_Offset_X_Y	Defines the behavior of OffsetX and OffsetY when changing Width or Height of the frame. When Hold_Offset_X_Y is set to 'Off' and user changes the Width, OffsetX is reset to center horizontally the ROI. When Hold_Offset_X_Y is set to 'Off' and user changes the Height, OffsetY is reset to center vertically the ROI. When Hold_Offset_X_Y is set to 'On', OffsetX and OffsetY always remain unchanged and: - if user changes Width and OffsetX+Width>WidthMax, Width is restored to previous value. - if user changes Height and OffsetY+Height>HeightMax, Height is restored to previous value (and OffsetY remains unchanged).

5.3.1 Dual ROI

5.3.1.1 *Dual ROI control*

Dual ROI mode is controlled by XML entries:

- *DualROI*
- *Height_ROI1*
- *Height_ROI2*
- *ROI1_OffsetY*
- *ROI2_OffsetY*
- *ImageHeightValid*
- *Width / OffsetX*
- *Height = Height_ROI1 + Height_ROI2, is updated automatically after setting an acquisition start. You can choose to update it manually.*

The figure here after shows how to use these entries.

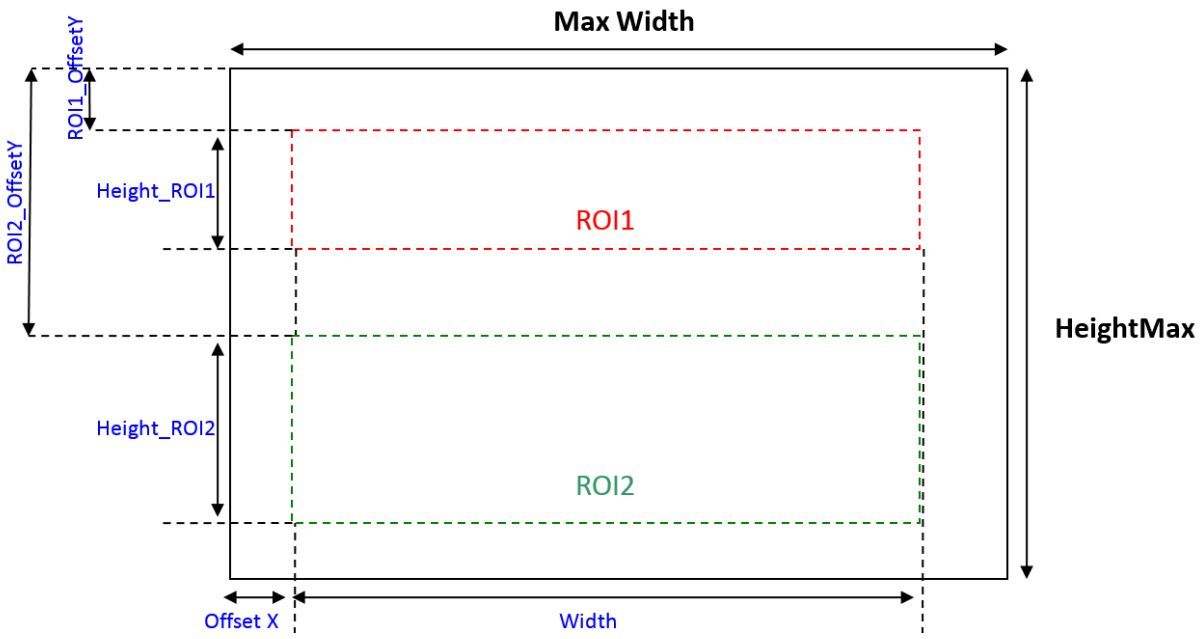


Figure 7: Dual ROI position definitions

5.3.1.2 *Enabling and Configuring dual ROI*

To enable and use multi ROI:

- Stop Acquisition
- Enable dual ROI mode (*DualROI* = "On")
- Set *Width / OffsetX* according your needs. All ROIs share the same *Width / OffsetX* and ROIs parameters *Height_ROI1 / ROI1_OffsetY* and *Height_ROI2 / ROI2_OffsetY*, following these rules
  - ⇨ (Width + Offset X) ≤ WidthMax
  - ⇨ (ROI1_OffsetY + Height_ROI1) < ROI2_OffsetY
  - ⇨ (ROI1_OffsetY + Height_ROI1) + (ROI2_OffsetY + Height_ROI2) ≤ HeightMax
- Image *Height* is automatically computed and updated
- Be sure that computed *Height* respects *Height* entry parameters (inc, min and max). You can check *ImageHeightValid* entry to be sure that your setup is valid.
- Start Acquisition

5.3.1.3 *Dual ROI output Image*

When using dual ROI mode, output image send to the Frame Grabber is one image composed by the 2 ROIs with:

Output width = *Width*

Output height = *Height = Height_ROI1 + Height_ROI2*

It is up to Frame Grabber application to separate ROIs according dual ROI parameters.

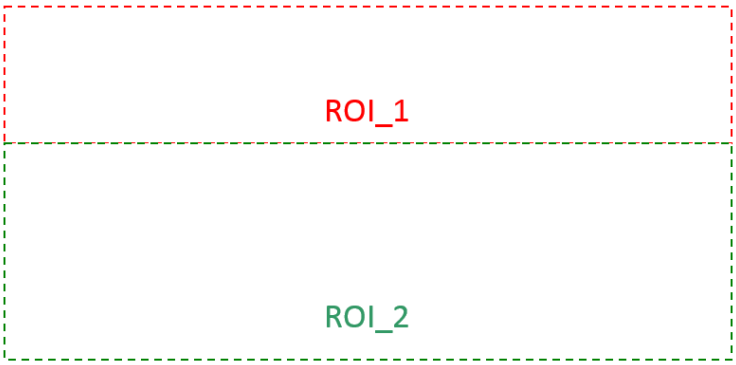


Figure 8: Camera output image when using multiple Roi

Line skipping feature may be used in addition to dual ROI mode, please check Line skipping paragraph for more information.

5.3.2 Line Skipping

If available, Line skipping feature allows to transfer only even lines and thus to increase frame transfer speed while keeping the same field of view.

When using dual ROI mode, you can enable line skipping only in one ROI or in both ROIs.

To enable line skipping:

- Stop acquisition
- Set frame / ROI parameters
- Enable line skipping
- Height is automatically computed (divided by 2 in single ROI or when activated in both ROIs)
- Check entry *ImageHeightValid* to be sure you set valid parameters

Line skipping is controlled by XML entries:

- *LineSkipping*
- *ImageHeightValid*

5.3.3 Defect Pixel Correction

5.3.3.1 *Principle*

A defect pixel correction can be applied to correct some pixel values using its neighbors. 8 pixels per line can be corrected, except for CycloneFiber-65 where only 4 pixels per line can be corrected.

At camera power up, defect pixel correction stored in camera flash memory is loaded and use in real time.

By default, a defect pixel correction is written in camera flash during camera production and used at power up. This is the "**Factory**" correction.

User can use this Factory correction or program its own correction by indicating dynamically which pixels must be corrected in XML interface. This is the "**User**" correction. Then, this User configuration can be saved in flash and used at next power up. User modifications are not automatically saved and will be lost at next power cycle if they are not saved.

User correction has boot priority over Factory correction. If user has saved a correction in flash, it will be used until User correction is erased from flash. Then Factory correction will be used again.

5.3.3.2 *Control*

DefectPixelCorrectionEnable enables “On” or disables “Off” defect pixel correction.

DefectPixelSource indicates the source of correction (User or Factory).

DefectPixelTotal indicates how many pixels are corrected. (Maximum number is total number of lines x 8).

DefectPixelTestMode enables “On” or disables “Off” a defect pixel test mode. This test mode purpose is to ease corrected pixel visualization. When enabled, all corrected pixels are shown in white and non-corrected pixels are shown in black. When disabled, sensor pixels are used, corrected or not, depending on *DefectPixelCorrectionEnable* value.

For CycloneFiber-5 and CycloneFiber-2 *DefectPixelLineSelect* selects a line (i.e. Y pixel coordinate) and *DefectPixelX0..X7* are the 8 pixel columns (i.e. X pixel coordinates) which can be corrected. If 65535 (0xFFFF) is set as coordinate, no pixel is corrected. To correct a pixel, a valid X coordinate must be set in one of *DefectPixelX0..X7* entry (valid values are 0 .. image_width). X and Y coordinate are absolute and based on full image size even if a smaller ROI is used.

For CycloneFiber-65 *DefectPixelLineSelect* selects a line address (equal to Y pixel coordinate divided by 2) and *DefectPixelX0..X3* are the 4 pixel columns (i.e. X pixel coordinates) which can be corrected for the line 2×*DefectPixelLineSelect. DefectPixelX4..X7* are the 4 pixel columns (i.e. X pixel coordinates) which can be corrected for the line 1+2×*DefectPixelLineSelect*.

If 65535 (0xFFFF) is set as coordinate, no pixel is corrected. To correct a pixel, a valid X coordinate must be set in one of *DefectPixelX0..X7* entry (valid values are 0 .. image_width-1). X and Y coordinate are absolute and based on full image size even if a smaller ROI is used.

To save current correction values (i.e. pixel coordinates set in *DefectPixelX0..X7* fields), user must call *DefectPixelUserFlashSave* command to save all values in flash. These values will be used at next power cycle and *DefectPixelSource* will return “User” as source.

To delete from flash any user data, user must call *DefectPixelUserFlashErase* command. Then all user correction values are erased and *DefectPixelSource* will return Factory as source at next power cycle.

Defect pixel correction is controlled by XML entries:

- *DefectPixelCorrectionEnable*
- *DefectPixelTestMode*
- *DefectPixelSource*
- *DefectPixelTotal*
- *DefectPixelLineSelect*
- *DefectPixelX0*
- *DefectPixelX1*
- *DefectPixelX2*
- *DefectPixelX3*
- *DefectPixelX4*
- *DefectPixelX5*

- *DefectPixelX6*
- *DefectPixelX7*
- *DefectPixelClearAll*
- *DefectPixelUserFlashSave*
- *DefectPixelUserFlashErase*

5.3.4 Flat Field Correction (FFC)

FFC correction is a column-based correction applied on all pixels. FFC correction consists in an FPN and a PRNU correction.

At power up, camera loads FFC flash data (= FPN and PRNU column coefficients) to RAM. User can dynamically modify column parameters using XML interface. Then, this new configuration can be saved in camera flash to be used at next power up. If it is not saved, all user modifications will be lost after next power cycle.

When enabled, each pixel is corrected using its column parameters:

- *FPN_Coeff(x)*: fixed pattern noise coefficient
- *PRNU_Coeff(x)*: photon response non-uniformity coefficient
- *UserGD_Offset*: user defined global dark offset
- *DMean_Offset*: dark image calibration mean value

where x is the column index.

Following steps can be done by the customer to calculate these coefficients:

- First, a sequence is taken in the dark. An average image is built from that sequence. The overall mean value of that image is called *DMean_Offset*. *UserGD_Offset* is a global dark offset that the customer can optionally add to the calculation.
- For every column x, an average value is calculated, leading to *D(x)*.
- Then a sequence is taken with a 70% saturation uniform light. An average image is built from that sequence. The overall mean value of that image is called *GMean*. For every column, an average value is calculated, leading to *G(x)*.

- Then we can calculate the missing *FPN_Coeff(x)* and *PRNU_Coeff(x)*:

$$FPN\_Coeff(x) = round\big(D(x)\big)$$
$$PRNU\_Coeff(x) = round\left(128 \times \frac{GMean}{G(x) - D(x) + 1}\right)$$

In the camera, for every *(x,y)* coordonate pixel with value *PixIn(x,y)*, the following correction is applied:

$$\big(PRNU\_Coeff(x) \times (PixIn(x,y) - FPN\_Coeff(x)) + 128 \times (DMean\_Offset + UserGD\_Offset)\big) \ll 7$$

FFC is controlled by XML entries:

- *Correction*
- *Correction_Coeff_X*
- *Correction_Coeff_V*
- *Correction_UserGD*

- *Correction_DMean*
- *FFCSaveToFlash*

5.3.5 Missing CoaXPress trigger packet detection

This feature allows to detect missing CXP trigger packets.

Camera is measuring CXP trigger packets (rising edge packets) period and compare it to a reference period set by user. If measured trigger packet period is **x1.5** higher than expected period, error counter is incremented.

To use this feature:

- Set camera and acquisition system in CoaXPress synchronization mode
- Set *CXP_trigger_ Period*
- Start sending CXP trigger packets and start camera acquisition
- Reset *CXP_Trigger_Counter_Reset*
- You can now poll *CXP_Trigger_Counter_Error* entry to detect missing CXP trigger packets.

Missing CXP trigger packet detection is controlled by XML entries:

- *CXP_Trigger_Period*
- *CXP_Trigger_Counter_Error*
- *CXP_Trigger_Counter_Reset*

5.3.6 Temperature

Camera returns FPGA die temperature using a temperature sensing diode (TSD). It helps you to monitor your system temperature stability and evolution.

Temperature is returned is Celsius degrees.

Temperature is controlled by XML entry:

- *Temperature*

5.4 UserSetControl

XML entry name address	Description
UserSetSelector	Selects the feature User Set to load
UserSetLoad	Loads the User Set specified by UserSetSelector to the device and makes it active
UserSetDefault	Selects the feature User Set to load and make active by default when the device is reset
UserSetSave	Save the User Set to the non-volatile memory of the device

This category allows to load or save a custom configuration to the camera.

To save camera parameters:

- Set all parameters needed in the different XML entries (Size, Framerate, Exposure, Gain, …)
- Set UserSetSave: your configuration will be saved to the non-volatile memory of the camera.

UserSetDefault allows to start the camera in either factory settings of customed settings saved by the customer.

To load camera parameters:

- Set UserSetSelector to either default (for factory settings) or USerSet0 for custom settings (configuration saved using USerSetSave command)
- Execute UserSetLoad command

UserSetControl is controlled by XML entries:

- *UserSetSelector*
- *UserSetLoad*
- *UserSetDefault*
- *UserSetSave*

6 Firmware Update

Camera firmware update is available through camera Aux connector by using the camera accessory “CPH6-USB”. This cable allows an USB connection to a PC and must be used together with Optronis Windows update software “CFU_CXXXX.exe”.

Before updating camera firmware, please check product website page (download tab) to be sure that you have:

- The last firmware version
- The driver setup

Please find below a quick description of the updating process:

1) If your software is out of date or if this is the first use:

Execute last version of “CycloneFiber_Driver_VCRedist_Install.exe” to install Firmware Update Software and Programming cable Drivers.
Restart computer.

2) Connect USB cable to PC and camera Aux input.
   Use PC rear USB ports as front ports are often not working.
3) Power cycle the camera.
4) Start CFU_CXXXX.exe

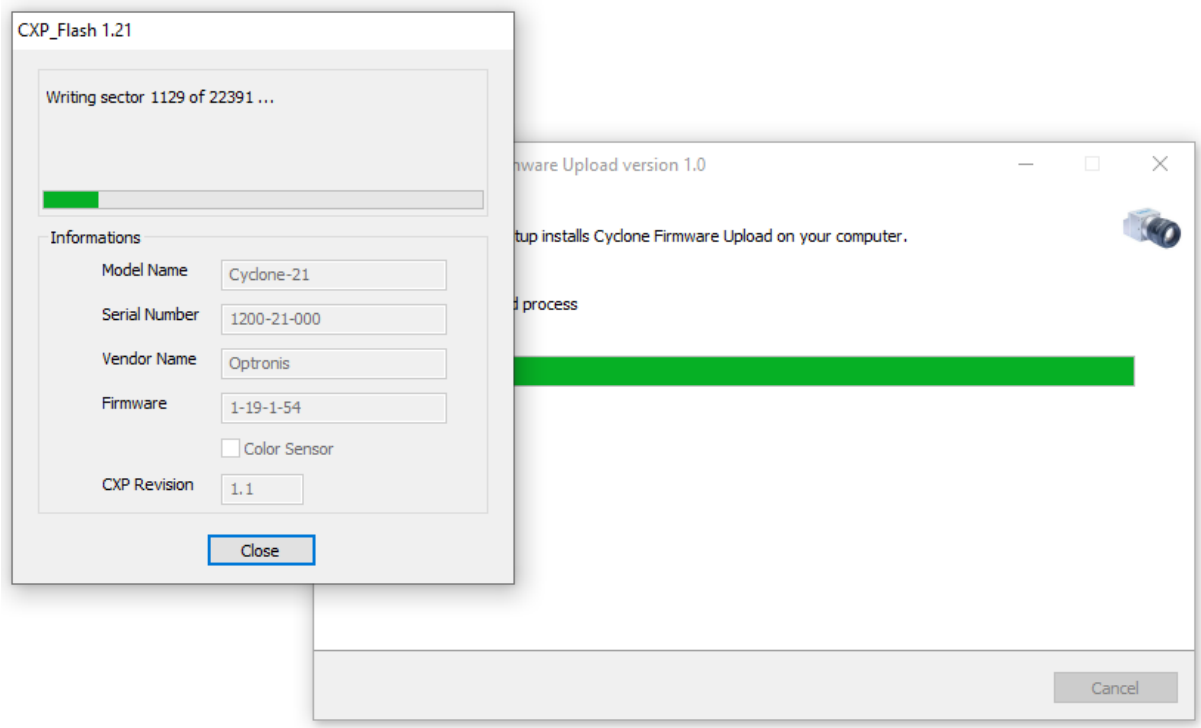


Figure 9: Firmware Update

5) Wait end of process (5 to 10 minutes, depending on camera and firmware size)
   Power cycle camera when programming is finished.

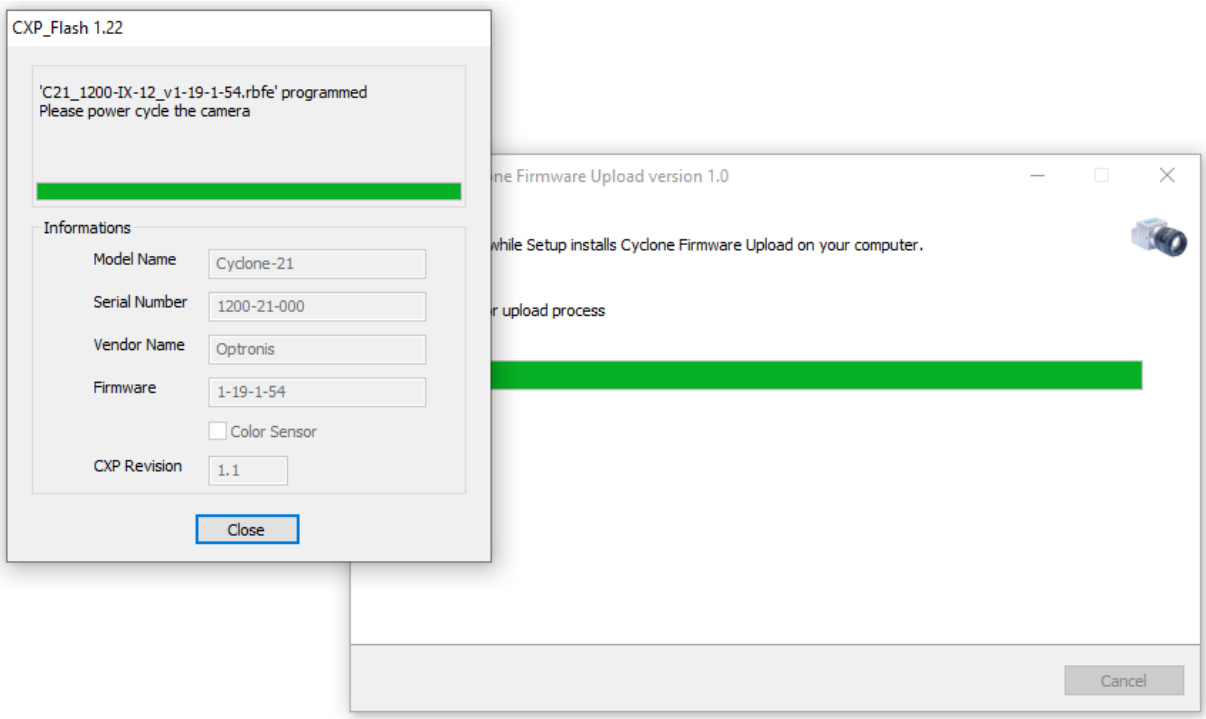
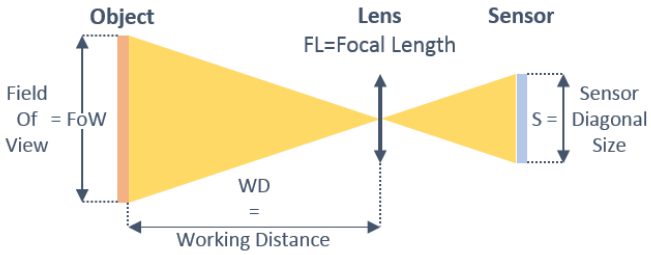


Figure 10: Firmware update finished

If remaining time is higher than 20min, it often means that the cable is not well detected. Close software and end “CFU_CXXXX.exe ” process in case it might still be running.
Choose another USB port, power cycle camera and restart software.

Annex A – Lens selection

A typical optical system can be represented as below.



Using above notations:

The sensor diagonal S is given with the technical data of the sensor or can be calculated based on pixel resolution and pixel size.:

$$\boldsymbol{Sensor\ Diagonal\ Size = S = PixelSize \times \sqrt{Resolution\_X^2 + Resolution\_Y^2}}$$

To select a lens, you can use the following formula:

$$\boldsymbol{Focal\ Length = FL = \frac{WD}{1 + \frac{FoW}{S}}}$$

Alternatively, if you already have a lens, you can compute working distance using the following formula:

$$\boldsymbol{Working\ Distance = WD = FL \times \left(1 + \frac{FoW}{S}\right)}$$

Examples:

- PixelSize = 0.008 mm
- Full resolution 1696 x 1708
- FoW = Object size = 200 mm
- WD = 600 mm

$$S = 0{,}008 \times \sqrt{1696^2 + 1708^2} = 19{,}26\ mm$$

$$FL = \frac{600}{1 + \frac{200}{19{,}26}} \sim 48{,}5\ mm$$

⇨ Selected focal length = 50 mm.

Same example but using a 35mm lens.

$$WD = 35 \times \left(1 + \frac{200}{19{,}26}\right) \sim 398\ mm$$

⇨ Object must be set at least at WD = 389 mm.

Annex B - Cleaning

Contaminations on the sensor cover glass or IR filter glass might affect image quality particularly when optical systems with high F-numbers are used. The camera is produced in a dust-controlled environment and sensor cleanliness is verify prior the camera is packed in a dust free plastic bag. Contaminations should be avoided but might occur during handling or operation. If sensor cleaning is needed, the following instructions must be observed:

- Only trained personal familiar with handling of optical equipment should clean the camera.
- The work should be done on a clean bench ideally in a durst free environment.
- ESD precautions must be respected.
- Removing the lens mount might simplify cleaning.
- First use dry and clean air to blow off particles from the sensor or IR filter.
  Avoid blowing on the mechanical parts or threads, as this might release particles contaminating the sensor.
- Only if blowing off does not result in a clean sensor cover glass, use lint free cotton buds soaked with clean alcohol (Ethanol or Isopropyl alcohol) and gently wipe on the glass. Wiping should always be in one direction and cotton bud should be used once only. Do not use cotton bud after they touched camera housing.
- When lens mount is installed again, camera should be oriented with the sensor facing down. This reduces the risk of sensor contamination from particles that are released when the mount is screwed onto the camera.