

# **CamPerform CP70-1-M/C-1000 CoaXPress Camera**



## **User Manual**

Ref. 1875-SU-01-J



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## Revision

Firmware	Date	Description
11.03	August 2016	8bit, 12bit, Speed increase only in y-direction, not in x-direction.
11.08	October 2016	-Add micro-second counter and image counter -Add hot pixel correction -Add CoaXPress 1.1.1 compatibility -Add user flash setup capabilities -Add Gain
11.09	December 2016	- Add Binning Mode
11.14	February 2017	- Add 2 Channels mode
11.17	May 2017	- Add Gain x16
11.18	June 2017	- Image Correctly centred when using offsets
13.0.1	July 2017	- Adding Granularity Mode - Bug fixes with Packet Tag

## General

### Declaration of conformity

Manufacturer: Optronis GmbH  
Address: Ludwigstr. 2, 77694 Kehl, Germany

We certify and declare under our sole responsibility that the following apparatus

Product: CP70-1-M-1000  
CP70-1-C-1000

are conform with the essential requirements of the EMC Directive 2014/30/EU, based on the following specifications applied:

Specifications : EN 61000-6-3      Emission  
                          EN 61000-6-1      Immunity

Kehl, 18.08.2016

Optronis GmbH  
Dr. Patrick Summ  
Managing Director

### RoHS compliance



CamPerform CP70-1-M/C-1000 cameras are Pb free manufactured.

## Scope of delivery

### CP70-1-M/C-1000 CoaXPress camera

Options:            /C: Color sensor (Bayer Pattern)  
                          (IR Cutoff Filter, Specification: 1830-SS-10)  
                          /M: Monochrome sensor

Lens mount:        /CM: CMount  
                          /FM: FMount  
                          /FMG: FMount for Nikon G-Lens series

CoaxPress:        6,25Gbit/channel, 2 or 4 channels

Synchronisation Adapter cable

Programming cable (USB2) for firmware update (Option)

User Manual (CD-ROM)

## Optronis customer service

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Germany  
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E-mail: [info@optronis.com](mailto:info@optronis.com)

For any questions or problems, please do not hesitate to ask our customer service. Please prepare the following information:

- Camera type: CP70-1-M-1000 or CP70-1-C-1000
- Serial-Number: see label at the bottom side of the camera
- Frame Grabber (and Firmware Version of the FrameGrabber)
- Operating System (Windows XP/Vista/7/8/10/32bit/64bit ...)
- Short description of the problem

## Remark, Attention

This user manual is compliant with the firmware version v. 11.03 of the camera.  
The following signs are used in the user manual



**Remarks and additional information**



**Attention**

## Precautions

### Camera Power

Please use Power over CoaxPress or as an option the CP70-1-M/C-1000 camera power supply (not included in shipment).

### Environmental Conditions

Temperature range during operation: < + 40°C (ambient temperature)  
> 0°C (ambient temperature)

Humidity during operation < 80% non-condensed



**At high ambient or housing temperatures, the camera lifetime will be reduced. Avoid camera operation beyond temperature limits. Please ensure, that the housing temperature will be kept as low as possible by additional heatsinks.**



## General Precautions

Read the user manual carefully before using the camera.

Do not orientate the optical input of the camera to direct sunlight.

Keep the camera free protected from dirt, dust, grease and water.

Make sure that all the connecting cables are in good condition. Defective cables have to be replaced.

Always unplug the camera before cleaning it. Do not use cleaning liquids or sprays. Instead, use a dry and soft duster.



There are no serviceable parts inside the camera. Do not open the housing of the camera.

Warranty becomes void if the camera housing is opened.

## Camera



- 1: Camera housing
- 2: Mounting holes 2x M4x6mm 1x ¼ ``x6mm
- 3: Lens mount (Nikon-F)
- 4: lens (Nikon-F compatible, Option)
- 5: electrical interface (back side)
- 6: Mounting holes 4x M4x6mm



1: CoaxPress Channels  
3: Auxiliary Connector

2: Power Connector  
4: Indicator Lamp (LED)

## Electrical Interface



Camera (Aux.) connector type: Hirose HR10A-7R-6S  
Cable Connector: Hirose HR10A-7P-6P

### Auxiliary (Aux.) connector pinout

Auxiliary (Aux.) connector pinout		
Pin Nr.	Description	
1	Sync. In	External Synchronisation Input TTL level: <0,8Volt (low) > 2 Volt (high)
2	reserved	-
3	Sync. Out	External Synchronisation Output (TTL level @ high impedance, 0 to 2 Volt @ 50 Ohms )
4+5+6	GND	Sync. Ground



To operate SyncIn correctly, a SyncIn driver circuit has to be used.

Minimum Sink Current (TTL Low Level) of the SyncIn Driver has to be 5mA. At 5mA Sink Current the input level at the SyncIn camera input drops below 0,8Volts.

Source Current (TTL High Level).of the SyncIn Driver is negligible (0mA)

Easiest driver circuit is a Transistor working in open collector configuration.



SyncIn input voltage limit ranges from – 5 Volts to + 30 Volts. Voltages applied beyond these limits may damage the SyncIn Input.



SyncOut has a built in 50 Ohm driver.

At 50 Ohm termination, the driver voltage is in between 0 (low level) to ~2 Volts (high level). At high impedance termination, the driver voltage

is in between 0 (low level) to ~4 Volts (high level).



SyncOut voltage limit ranges from 0 Volt to + 5 Volts. Voltages applied beyond these limits may damage the SyncOut Output.



The Auxiliary connector may also be used to update the firmware of the camera. Please use the USB2 programming adapter cable.

## Camera Power



Figure: CP70-1-M/C-1000 back view

Camera (Pwr.) connector type: Hirose HR10A-7R-4S

Cable Connector: Hirose HR10A-7P-4P


Power (Pwr.) connector pinout		
Pin Nr.	Description	
1+2	VCC	DC Power +24Volt +/-5% (Ripple < 200mV) Inrush Current ~0,6A
3+4	GND	Power Ground



Alternatively, Power over CoaxPress (PoCXP) should be used.

## Indicator Lamp (LED)

State	Indication
No power	Off
System booting	Solid orange
Powered, but nothing connected (only for power over power connector)	Slow pulse red
Linkt detection in progress, PoCXP active	Fast flash green
Linkt detection in progress, PoCXP not in use	Fast flash orange
Camera / Grabber incompatible, PoCXP active	Slow flash alternate red / green
Camera / Grabber incompatible, PoCXP not in use	Slow flash alternate red / orange
Camera connected, but no data being transferred	Slow pulse green
Camera connected, waiting for event (e.g. trigger, exposure pulse)	Slow pulse orange
Camera connected, transferring frames	Solid green
Error during data transfer	500ms red pulse
System error	Fast flash red


Camera is in calibration mode, when all LEDs are flashing slowly.

## CoaxPress Data Channels

To operate the camera, all 4 CoaXPress Channels (Labeling: BNC 4x) have to be used. Channel 1 is Master link. Channel 2, Channel 3 and Channel 4 are Extension links. Channel 1 uses Power over CoaxPress (PoCXP). Speeds of the Downlink are 6,25Gbit/s.

## Lens mount and handling

### Nikon F-Mount adapter

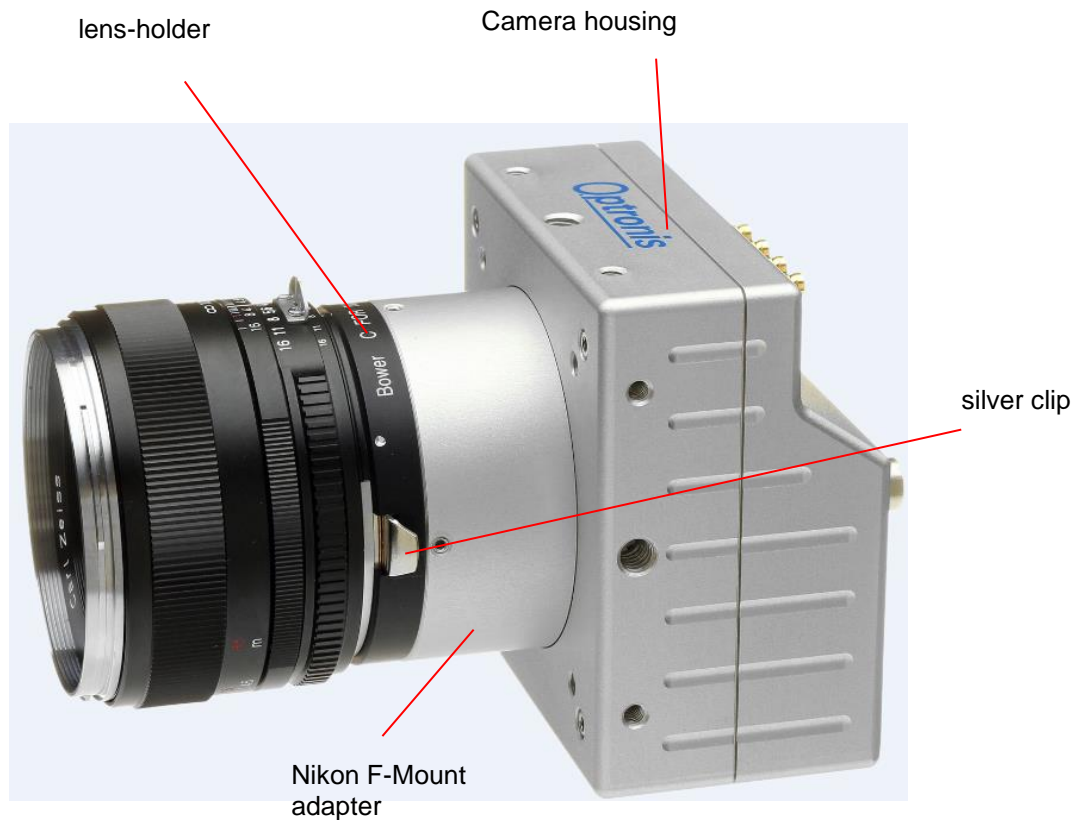
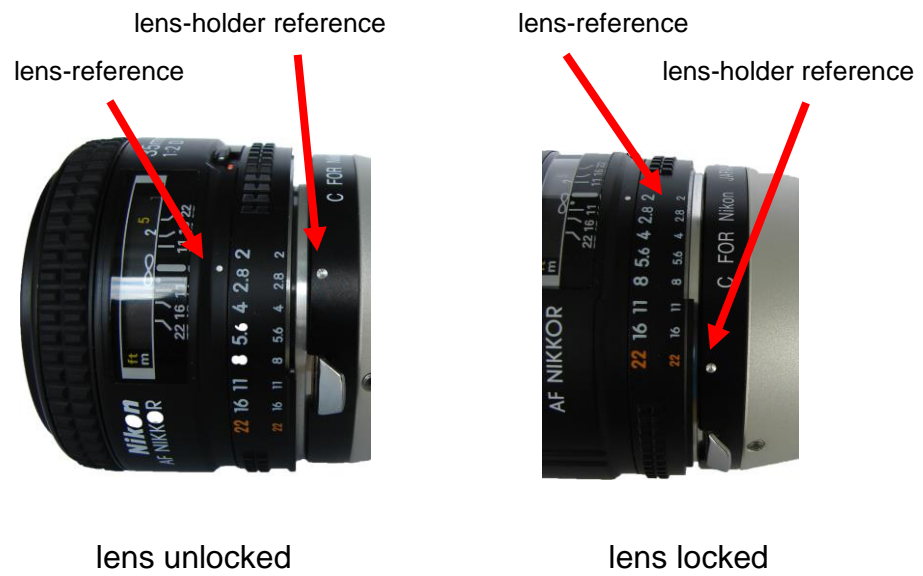


Figure: Camera with Nikon F-Mount adapter

To mount the lens, it has to be positioned on the lens-holder in a way, that the back surface of the lens is completely attached to the surface of the lens-holder.

The lens-reference has to be positioned in face to the lens-holder reference as shown in the figure below. Then, the lens has to be turned anti-clockwise until the silver clip on the lens-holder locks.





To unmount the lens, pull back first the silver clip in order to unlock the lens as shown below. Then (the silver clip has still to be pulled back) turn the lens clockwise until the lens is unmounted completely.



## **C-Mount adapter**

To mount the C-Mount lens, unscrew the protective cover anti-clockwise and mount the C-Mount lens into the lens holder.

To unmount the lens, unscrew the C-Mount lens anti-clockwise.

## **Important features**

The CamPerform CP70-1-M/C-1000 CoaXPress cameras are high frame rate CMOS area scan camera that are designed for industrial use. The image sensor and the camera offer exceptional high performance:

- excellent image quality
- excellent sensitivity
- low noise
- monochrome and color
- internal and external synchronisation

## **Frame format**

The Frame format (frame resolution) of the camera is 1280 active Pixels in horizontal (x) direction and 1024 active Pixels in vertical (y) direction at full resolution. The frame format can be reduced by factor of 32 Pixel in horizontal direction and factor of 4 Pixel in vertical direction.

## **Minimum Frame rate (@ internal synchronisation)**

Minimum frame rate is limited to 20 fps in free run mode.

## Maximum Frame rate (@ internal synchronisation)

### Max. Frame Rate Examples (8bit):

CoaxPress labeling	Pixel resolution x (Pixel)	Pixel resolution y (Pixel)	Max. Frame Rate (fps)
CXP6, BNC 4x	1280	1024	1051
CXP6, BNC 4x	640	480	4087
CXP6, BNC 4x	256	256	7540
CXP6, BNC 4x	128	128	14573

(Max. Frame Rate values are rounded values)

### Calculation of Maximum Frame Rate at CXP6 BNC 4x in 8bits mode (only for max. resolution):

For  $X > 960$ :  $1000000 / [0.922222 * (\text{SizeY} + 4) + 2.62]$

For  $X \leq 960$  and  $X > 640$ :  $1000000 / [0.722222 * (\text{SizeY} + 4) + 2.62]$

For  $X \leq 640$ :  $1000000 / [0.5 * (\text{SizeY} + 4) + 2.62]$

### Calculation of Exposure Time in 8 bits mode

Exposure Time Max. =  $1/\text{Framerate} - 2 \text{ us} = 949 \text{ usec}$

Min. Exposure Time: 2 usec

### Max. Frame Rate Examples (12bit):

CoaxPress labeling	Pixel resolution x (Pixel)	Pixel resolution y (Pixel)	Max. Frame Rate (fps)
CXP6, BNC 4x	1280	1024	1051
CXP6, BNC 4x	640	480	4087
CXP6, BNC 4x	256	256	7540
CXP6, BNC 4x	128	128	14573

(Max. Frame Rate values are rounded values)

**Calculation of Maximum Frame Rate at CXP6 BNC 4x in 12bits mode:**

For X > 960:  $1000000 / [0.922222 * (\text{SizeY} + 4) + 2.62]$

For X ≤ 960 and X > 640:  $1000000 / [0.722222 * (\text{SizeY} + 4) + 2.62]$

For X ≤ 640:  $1000000 / [0.5 * (\text{SizeY} + 4) + 2.62]$

**Calculation of Maximum Exposure Time in 12bits mode:**

Exposure Time Max. =  $1 / \text{Framerate} - 2 \text{ us} = 949 \text{ usec}$

Min. Exposure Time: 2 usec

**Max. Frame Rate Examples (8bit or 12 bits): Gain x16**

CoaxPress labeling	Pixel resolution x (Pixel)	Pixel resolution y (Pixel)	Max. Frame Rate (fps)
CXP6, BNC 4x	1280	1024	1051
CXP6, BNC 4x	640	480	2227
CXP6, BNC 4x	256	256	4125
CXP6, BNC 4x	128	128	8041

(Max. Frame Rate values are rounded values)

**Calculation of Maximum Frame Rate at CXP6 BNC 4x in 8bits or 12 bits mode (only for max. resolution):**

$1000000 / [0.922222 * (\text{SizeY} + 4) + 2.62]$

## Frame Rate (@ external synchronisation)

For external synchronisation please apply a TTL signal to the Sync In and Sync Out BNC adapter of the adapter cable (scope of delivery). External synchronisation may be operated in level detection mode. Please see the external synchronisation timing for more information about resulting frame rates and exposure times.

Alternatively SyncIn can be applied directly between Pin 1 and Pin 3 on the camera power (Pwr.) connector, Sync Out between Pin 4 and Pin 3. The synchronisation output can be used to synchronise other devices as e.g. additional cameras or external light flashes.



The External synchronisation frame rate range can reach any value between 20 fps and maximum Frame Rate @ internal synchronisation.

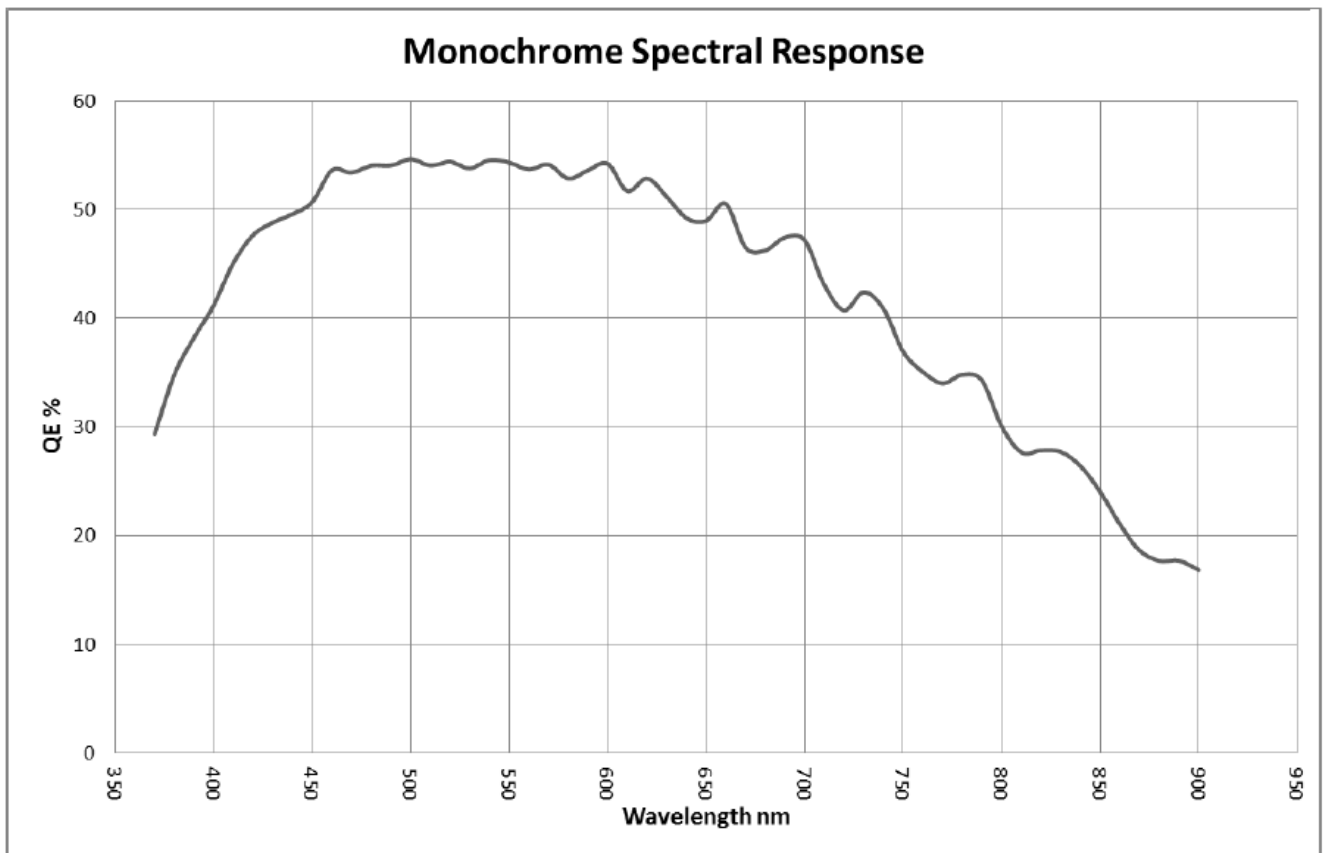
## Technical Data

### General

Power Source	PoCXP Alternatively: + 24 Volt +/- 5% DC < 200mV ripple
Power	approx. 8,5 Watt
Pixel Number	1280x1024
Pixel size	6,6 µm x 6,6 µm
Active area	8,448 mm x 6,758 mm
Sensor responsivity	9,6 Volt/lux.s
Shutter	Global
Minimum Ambient Temperature	0 °C
Maximum Housing Temperature	+ 40 °C Ambient Temperature !!! avoid high temperature at camera housing. Please add additional heatsinks at high temperatures !!!
Humidity	< 80% relative, non-condensed
Interface	CoaXPress BNC 4x CXP6
Uplink	Over CoaXPress
Video interface	CoaxPress
Size	85 mm x 85 mm x 84,5 mm (F-Mount)
Weight	approx. 470 g without lens mount

**Spectral Response / Transmittance**

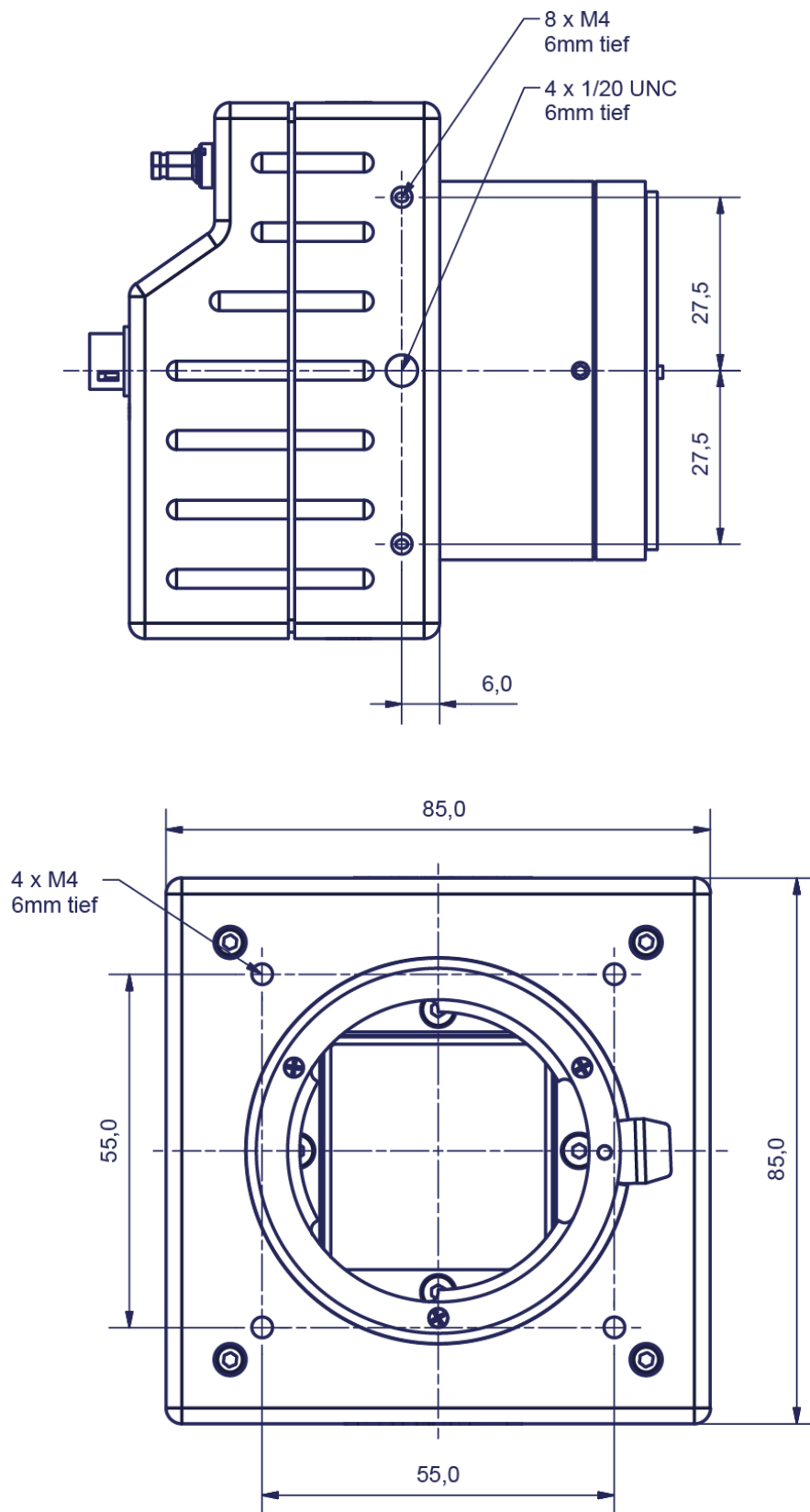
Spectral response (Monochrome Sensor)



!!! for QE at > 900 nm please ask Optronis support !!!

Mechanical Dimensions

F-Mount Lens (/FM)





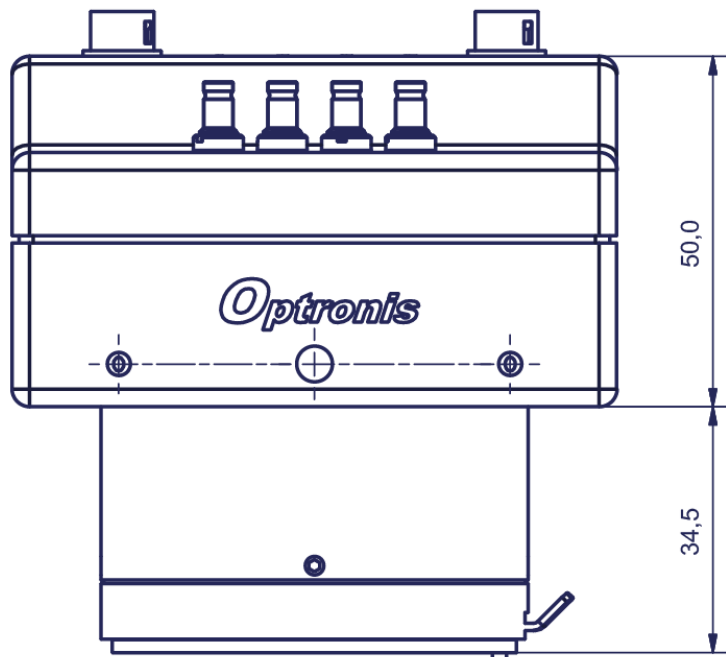
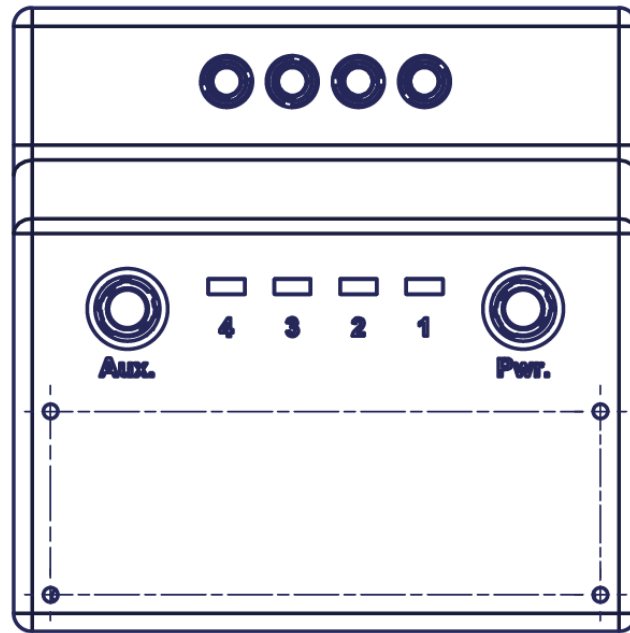


Figure : Side View (all dimensions in mm)

Screw threads in socket:

M4 min. 6 mm depth

1 x ¼ `` min. 6 mm depth (in the middle)

**Synchronisation Input schematics**

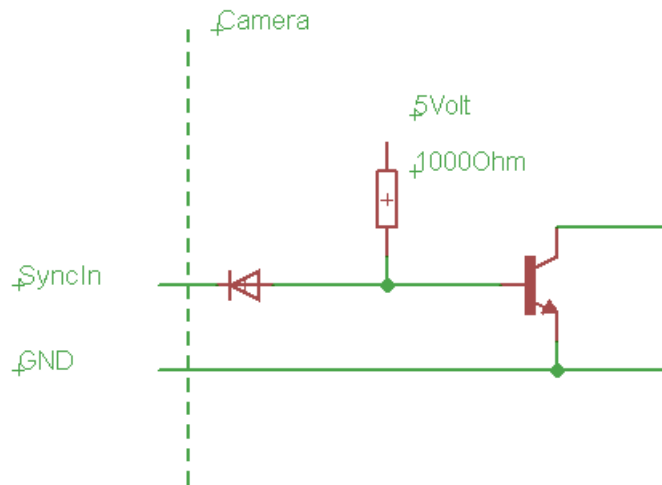


Figure: SyncIn Schematics (for illustration only)

**Synchronisation Output schematics**

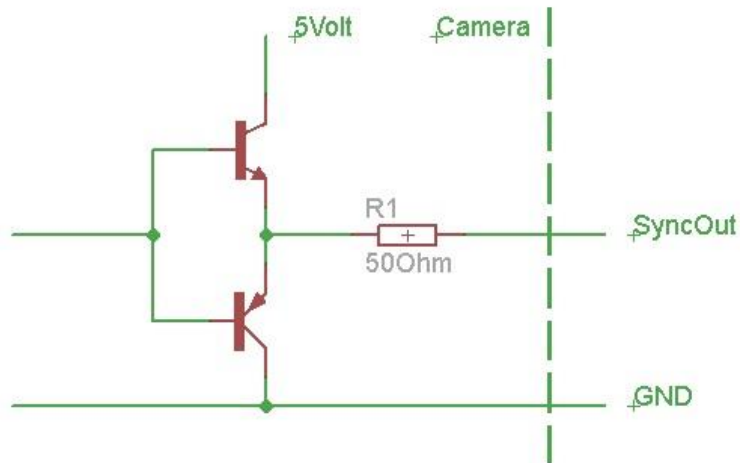
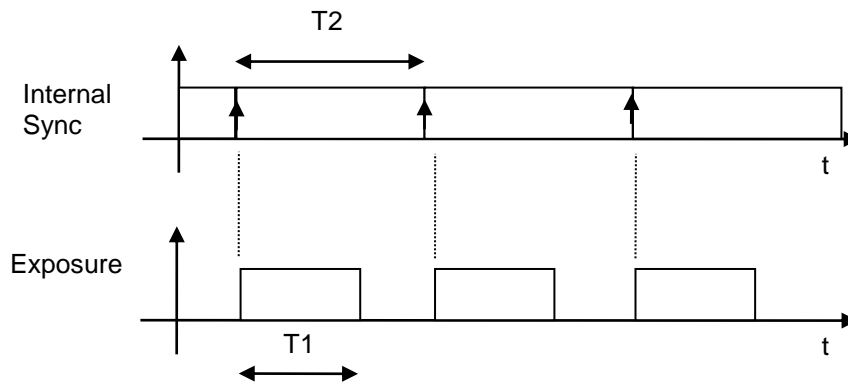


Figure: SyncOut Schematics (for illustration only)

## Internal Synchronisation Timing



T1: Exposure time, selected by software

T2: Frame Interval (1/Frame Rate), selected by software

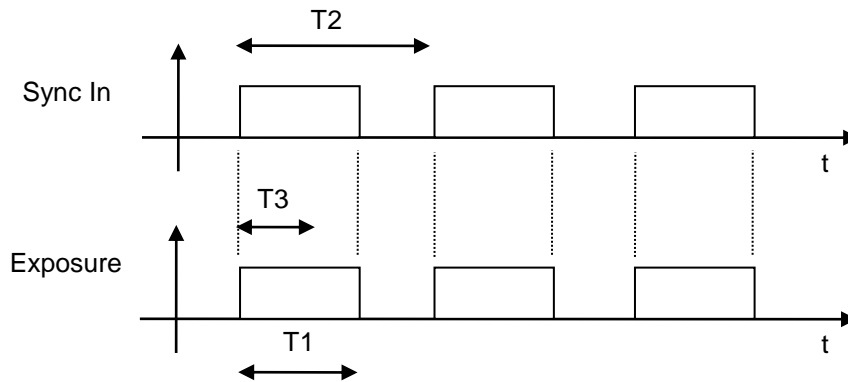
### Synchronisation Output

Logic 1 during Exposure Time (T1)

**External Synchronisation Timing**

**Synchronisation Input “level detection”**

positive level:



Sync In rising level to Exposure Delay: ~ 2.7usec +/- 500 nsec typical

T1: Exposure time

T2: 1/Frame Rate

T3: 1/Maximum Frame Rate (limited by readout of the sensor)  
depends on frame format

$1/T_2$  has to be larger than 20 fps

**Synchronisation Output “level detection”**

Logic 1 during Exposure Time (T1)

## Camera firmware update

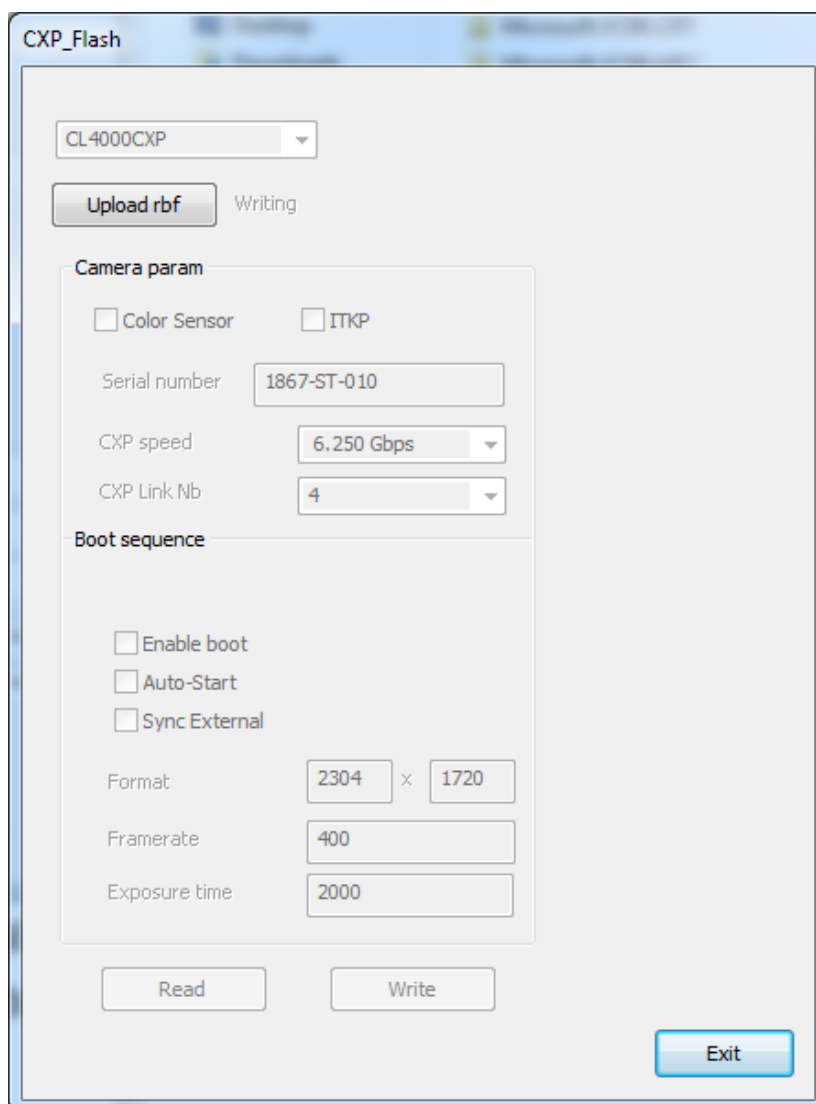
Camera firmware update is available through the USB programming cable and the UCXP\_Flash software (located in the CXPFlash\_Setup folder) delivered with the camera.

Please go through the following steps :

- 1) Switch OFF camera
- 2) Connect USB cable to PC and camera Aux. input.
- 3) Install USB driver on PC if it is not already done.

To install USB driver, launch USB\_Setup.exe (located in the CXPFlash\_Setup folder) and then Reboot PC.

- 4) Switch ON camera
- 5) Launch UCXP\_Flash.exe



Click on "Upload rbf" and select the file cxp1xxx.rbf.

Wait until finished.

6) Click on Exit.

7) Switch OFF camera and switch ON camera.

## Camera mapping

This part is an extract of the GenICam xml file.

### **DeviceVendorName**

Name of the manufacturer of the device.

### **DeviceModelName**

This feature provides the model of the device

### **DeviceManufacturerInfo**

This feature provides extended manufacturer information about the device

### **DeviceVersion**

This feature provides the version of the device

### **DeviceFirmwareVersion**

Version of the firmware in the device

### **DeviceID**

This feature stores a camera identifier

### **DeviceReset**

Resets the device to its power up state. Write 0x1 to reset the device.

### **WidthMax**

Maximum width (in pixels) of the image

### **Width**

This feature represents the actual image width expelled by the camera (in pixels).

### **HeightMax**

Maximum height (in pixels) of the image

## Height

This feature represents the actual image height expelled by the camera (in pixels).

## OffsetX

Horizontal offset from the origin to the area of interest (in pixels) (Need to stop the live sequence to change the value)

## OffsetY

Vertical offset from the origin to the area of interest (in pixels)

## PixelFormat

This feature indicates the format of the pixel to use during the acquisition

## AcquisitionMode

This feature controls the acquisition mode of the device

## Granularity Mode

When 'ON', exposure time is set by register (ExposureTime) when using external triggering or trigger over CoaXPress

When 'OFF', exposure time is set by external or CXP trigger pulse width.

## AcquisitionStart

This feature starts the Acquisition of the device

## AcquisitionFrameRate

Frame rate in Hz

## AcquisitionFrameRateMax

Maximum frame rate in Hz

## ExposureTime

Sets the Exposure time (in microseconds)

## ExposureTimeMax

Maximum Exposure time (in microseconds)



## Gain

x1,x2,x4,x16 (To Set Gain x16, user need to stop the live sequence : framerate is limited in lower resolutions)

## ColorSensor

Has camera a color sensor.

Return 0x1 for a color sensor and 0x0 for a monochrome sensor

## AddCounterInformation

When set to 'Yes', counter informations are integrated in the first pixels of every transferred frame:

- 16 first bits contain an image counter (incrementing with every frame transferred)
- 24 next bits contain a micro-second precision counter that indicates the time when exposure has started.

When set to 'No', no information is integrated in the transferred frames.

## HotPixelCorrection

When set to 'On', hot pixel correction is activated.

When set to 'Off', hot pixel correction is deactivated.

## EnableFPN

When set to 'On', FPN correction is activated.

When set to 'Off', FPN correction is deactivated.

## EnableFPN2

When set to 'On', FPN correction 2 is activated.

When set to 'Off', FPN correction 2 is deactivated.

## EnableBinning

When set to 'On', Binning is activated. (Live has to be stopped to do this change)

When set to 'Off', Binning is deactivated. (Live has to be stopped to do this change)

## EnableLUT

When set to 'On', LUT correction is activated.

When set to 'Off', LUT correction is deactivated.

## **FactoryFlash**

When called, factory settings are restored to flash and at the next camera boot.

## **SaveToFlashWithRebootAndWithoutAutoStart**

When called, camera saves its current parameters to flash. These parameters are restored at next camera boot.

## **SaveToFlashWithRebootAndWithAutoStart**

When called, camera saves its current parameters to flash. These parameters are restored at next camera boot. And also the camera starts transferring frames automatically.

## Gen<i>Cam

Optronis ships together with the CP70-1-M/C-1000 camera a XML file that is Gen<i>Cam compatible. The XML file follows the SNFC (Standard Features Naming Convention).

Please ask, if needed, the Optronis customer service for the availability of this XML file.