

## **xiRAY** | MX510XG-GP sample setup

preliminary

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## 1. General overview

The cameras MX510XG-GP-\* use a TB3 / PCIe G3X4 Firefly interface.

Two camera models are offered.

Model	Scintillator	Active image size [mm]	Resolution	ADC [bits]	FWC [ke-]	Readout noise [e-]	DR [dB]	FPS
MX510XG-GP-FA-GO	GadOx:Eu, 10u, 2.5u grain	38.9 x 27.8	8464 x 6058 51 MPix	12	24	1.6	84	30
MX510XG-GP-TP2:1-GO	GadOx:Eu, 22u, 2.5u grain	70.5 x 50.4	8464 x 6058 51 MPix	12	24	1.6	84	30

Notes:

- the cameras are technical samples – please ask for details about the status

The Firefly interface is designed to integrate the cameras into systems that are as compact as possible.

This document describes the recommended configuration of the cameras and accessories for operation to a standard computer.

### 1.1. X-ray cameras - support page

Most recent info about XIMEA's x-ray cameras is available at <https://www.ximea.com/support/projects/standard-cameras/wiki/X-RAY>

## 2. Camera details

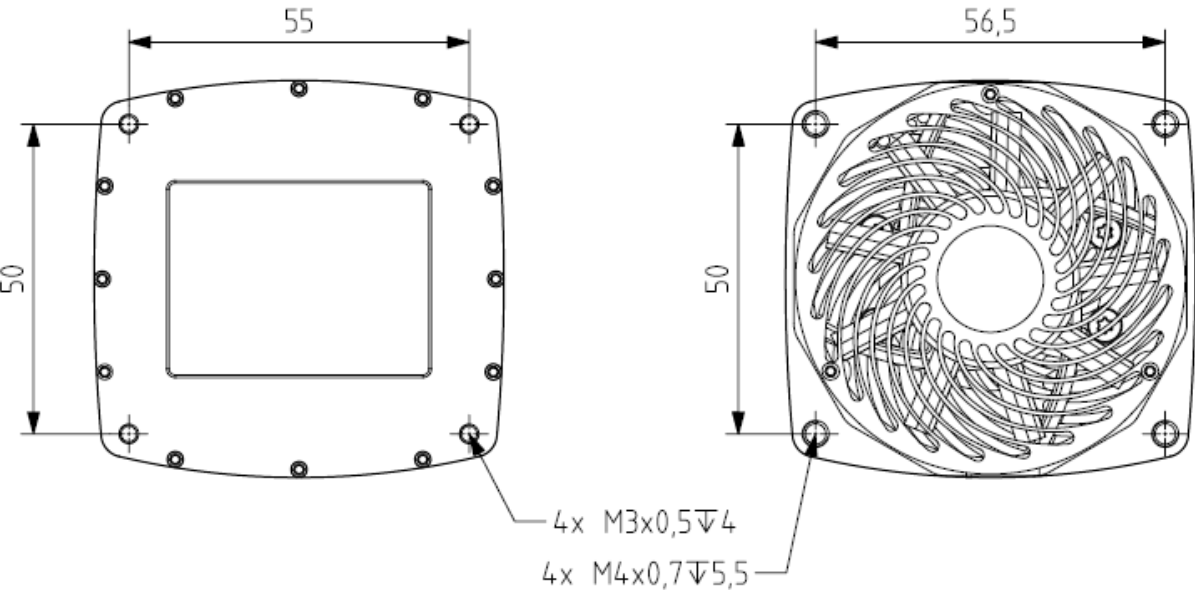
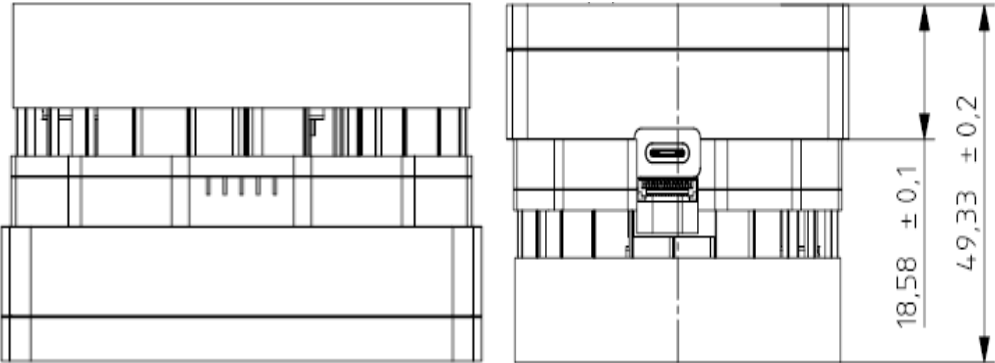
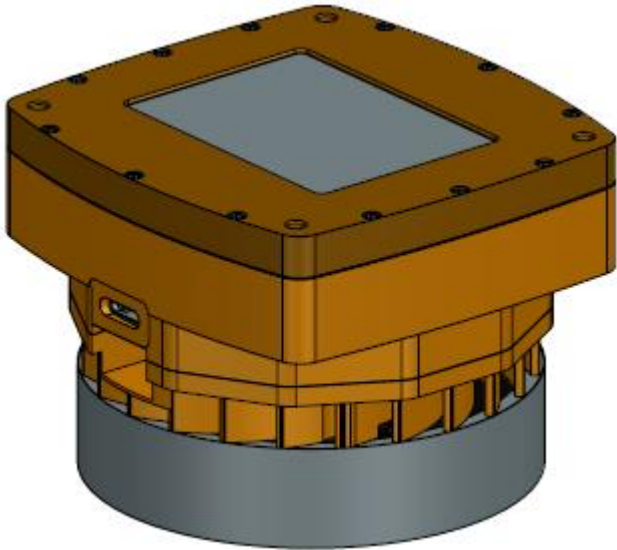
### 2.1. MX510XG-GP-FA-GO

Cooled scientific TB3/PCIe X-ray sCMOS camera, 51MP, 1:1 fiber optic plate, GadOx scintillator  
CMOS sensor GPixel GMAX4651 grade 1 with Peltier TE Cooling

#### 2.1.1. Specifications

Active x-ray image size	38,9 x 27.8 mm <sup>2</sup>
Effective pixel size	4.6 μm
Entrance windows	Radiation hardened glass
Scintillator	GadOx:Eu, 10μm thick, 2,5μm grain
Fiber optics plate	Enhanced Statistical Extra-Mural Absorption
x-ray energy level	7 – 150 keV
Resolution	51 MPix, 8464 × 6058 pixels
Frame rates	30 Fps
Sensor model	Gpixel GMAX4651 grade 1
Sensor type	CMOS
Sensor size	Full frame 35mm
Sensor active area	38,9 x 27.8 mm <sup>2</sup>
Readout method	Global shutter
Sensor pixel size	4.6 μm
Digitization	12 Bit
Data interface	Thunderbolt 3, PCIe Gen3 x4 FireFly
Dynamic range	84 dB (HDR) / 65 dB
Full Well Capacity	24 000 e <sup>-</sup> (HDR) / 18 000 e <sup>-</sup>
On-Chip binning	1x1, 2x2, 4x4, 8x8
Dark current	6 e <sup>-</sup>
Readout noise typ.	1.6 e <sup>-</sup> (HDR) / 9 e <sup>-</sup>
Power consumption	3.5 W - 16 W with Cooling
Dimensions WxHxD	63 x 63 x 53 mm <sup>3</sup>
Cooling	Up to -25°C (with Peltier TEC)

2.1.2. Drawings



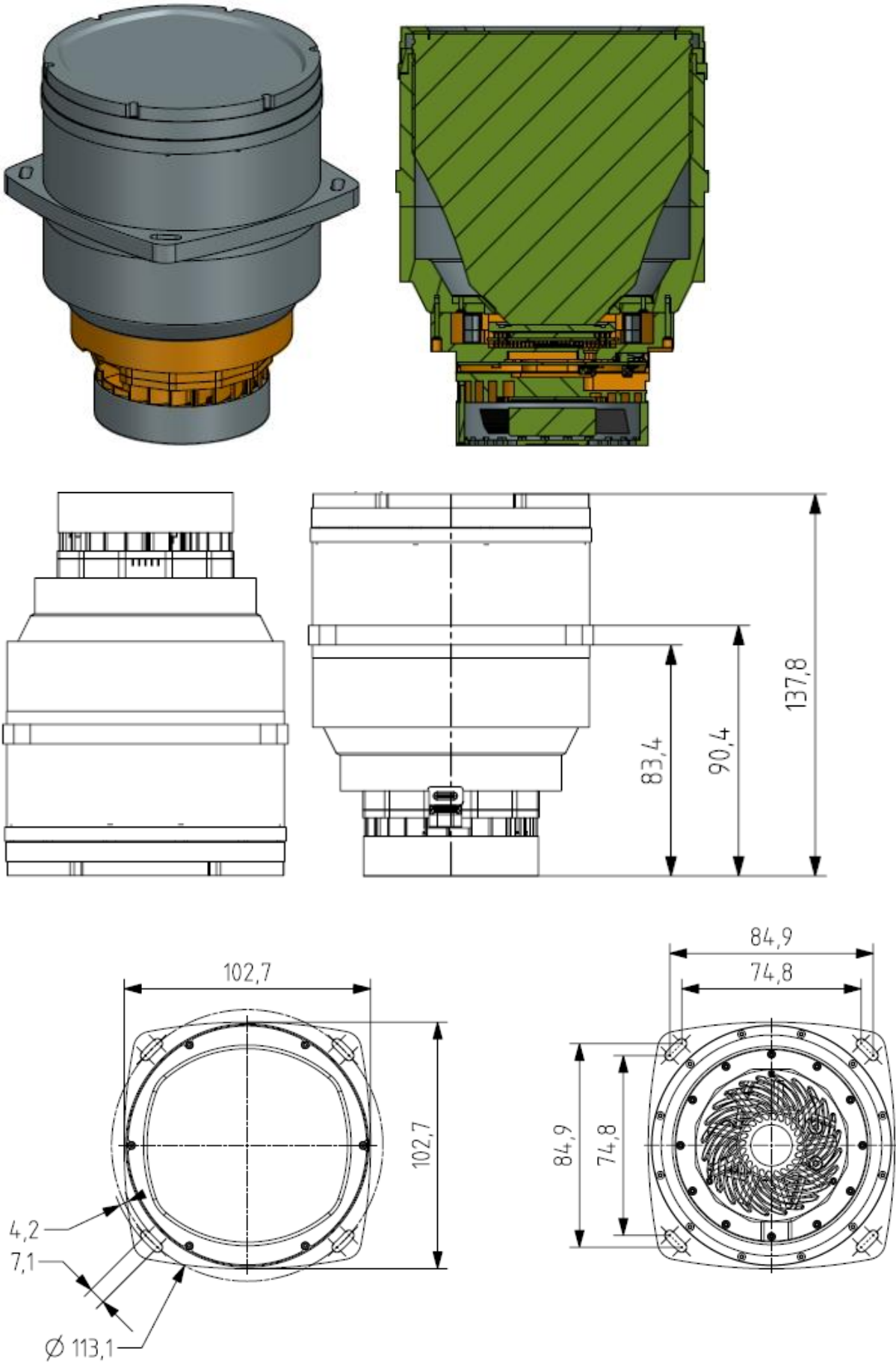
## 2.2. MX510XG-GP-TP2:1-GO

Cooled scientific TB3/PCIe X-ray sCMOS camera, 51MPix, 2:1 tapered fiber optic plate, GadOx scintillator  
CMOS sensor Gpixel GMAX4651 grade 1 with Peltier TE Cooling

### 2.2.1. Specifications

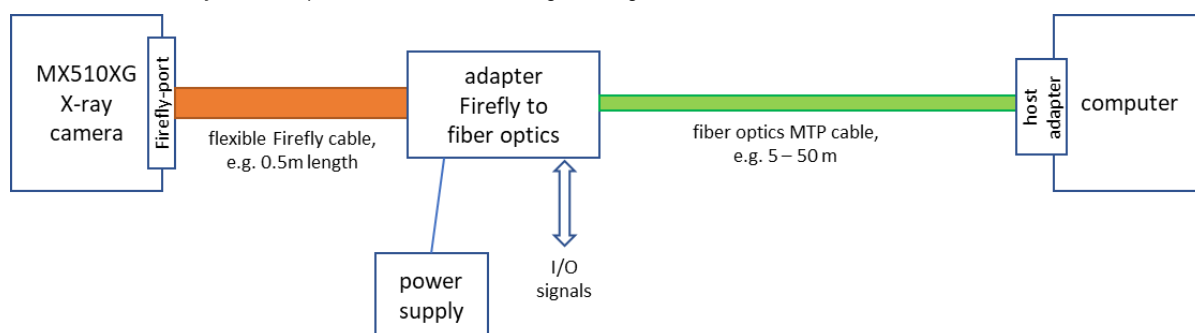
Active x-ray image size	70.5 x 50.4 mm <sup>2</sup>
Effective pixel size	8.5 μm
Entrance windows	Radiation hardened glass
Scintillator	GadOx:Eu, 22μm thick, 2.5μm grain
Fiber optics plate	Enhanced Statistical Extra-Mural Absorption
x-ray energy level	7 – 150 keV
Resolution	51 MPix, 8464 × 6058 pixels
Frame rates	30 Fps
Sensor model	Gpixel GMAX4651 grade 1
Sensor type	CMOS
Sensor size	Full frame 35mm
Sensor active area	38,9 x 27.8 mm <sup>2</sup>
Readout method	Global shutter
Sensor pixel size	4.6 μm
Digitization	12 Bit
Data interface	Thunderbolt 3, PCIe Gen3 x4 FireFly
Dynamic range	84 dB (HDR) / 65 dB
Full Well Capacity	24 000 e- (HDR) / 18 000 e-
On-Chip binning	1x1, 2x2, 4x4, 8x8
Dark current	6 e-
Readout noise typ.	1.6 e- (HDR) / 9 e-
Power consumption	3.5 W - 16 W with Cooling
Dimensions WxHxD	63 x 63 x 53 mm <sup>3</sup>
Cooling	Up to -25°C (with Peltier TEC)

2.2.2. Drawings



### 3. Recommended configuration / accessories

The recommended system setup is shown in the following drawing:



The camera transmits data and is powered via the flexible Firefly cable and can be controlled via the integrated trigger input and output.



The central connecting link is the adapter "in the middle". This connects the camera with the computer, the power supply and the trigger signals.



### 3.1. Firefly interface (camera and adapter)

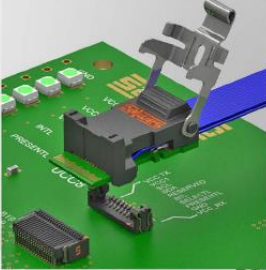
The interface connectors are used for data transmission, camera control, power and IO. Minimal operation connectivity requires connection of FIREFLY™ connector and power connector (PWR).

The use of the cable / interface is shown in the following overview (© Samtec):

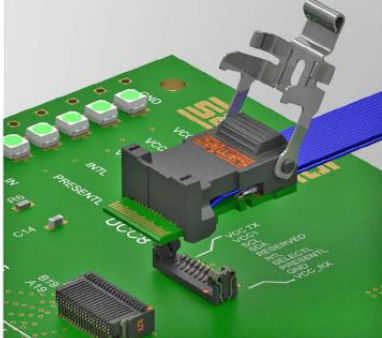



## INSERTION AND REMOVAL INSTRUCTIONS

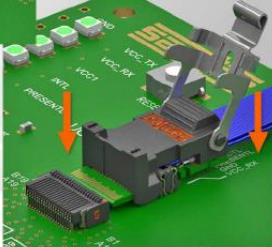
**1** Align optical or copper assembly so that notches in PCB are over the positive latching receptacle.



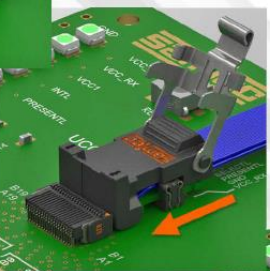
**Unmated (Latch Open)**



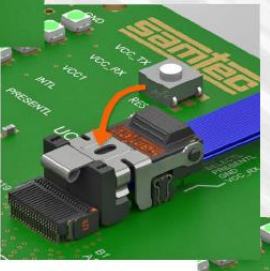
**2** Drop cable assembly down keeping it parallel to the board.



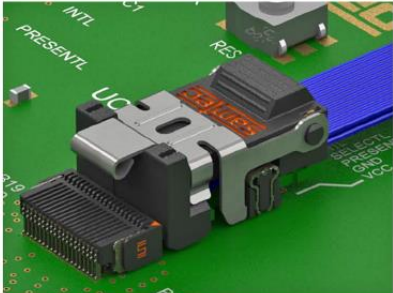
**3** Slide cable assembly forward until engaged, keeping it level with the board.



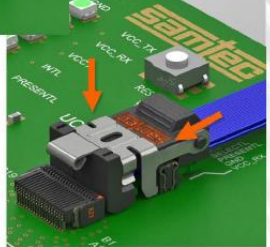
**4** Rotate latch downwards until parallel to board.



**Mated (Latch Down)**



**5** Depress latch to lock cable assembly into the connector. Removal is reverse of installation.



### 3.2. Firefly cables

XIMEA offers different Firefly cables with copper wires. The camera is also supplied with power via these cables. To limit the current, a voltage of 24V should be applied. It is recommended to use short cables (max. 1m length).

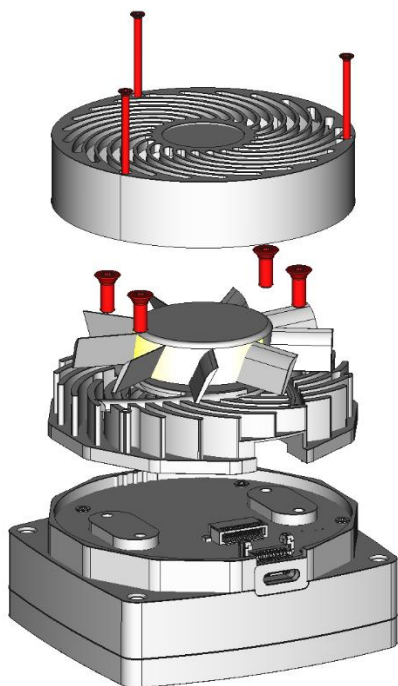
Available cables:

CBL-ECUE-X4G3-0M15	15 cm FireFly copper flat ribbon cable, PCIe Gen3 x4 (recommended)
CBL-ECUE-X4G3-0M25	25 cm FireFly copper flat ribbon cable, PCIe Gen3 x4
CBL-ECUE-X4G3-0M50	50 cm FireFly copper flat ribbon cable, PCIe Gen3 x4
CBL-ECUE-X4G3-1M0	1m FireFly copper flat ribbon cable, PCIe Gen3 x4

In order to connect the Firefly cable to the camera the rear assembly of the camera needs to be removed:

- Unscrew the three M1.6 screws which fix the fan cover and remove the cover
- Unscrew the four M3 screws and remove the heatsink block together with the fan.

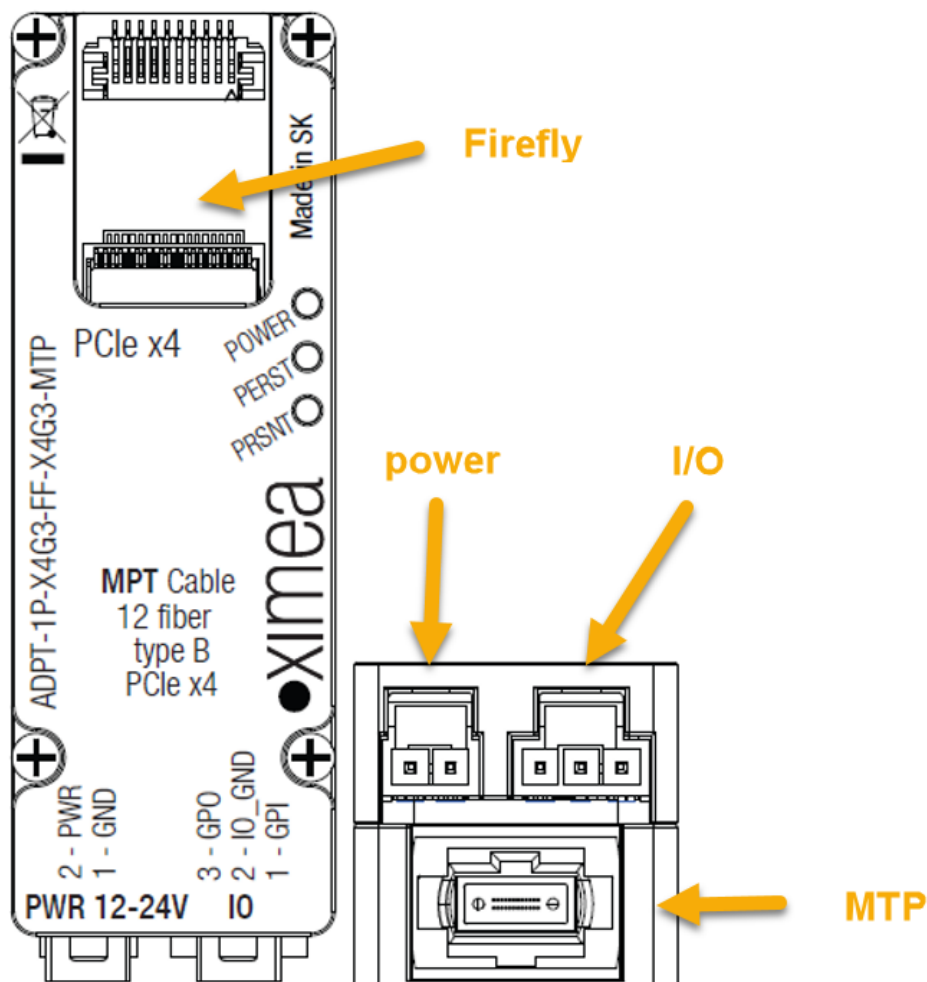
Please note the following drawing:



### 3.3. ADPT-1P-X4G3-FF-X4G3-MTP, Adapter Firefly – MTP fiber optics cables

The adapter ADPT-1P-X4G3-FF-X4G3-MTP connects a camera with 1 PCIe Gen.3 x4 Firefly port to a computer with a PCIe Gen.3 x4 fiber optics MTP connector (cables with 12 fibers).

The following drawings show the adapter and its connections:



A power cable CBL-XEC2-PWR-0M15 is supplied with the ADPT-1P-X4G3-FF-X4G3-MTP to connect the power supply PSU-GSM60B24-P1J to the power input.



The cable is delivered together with the adapter ADPT-1P-X4G3-FF-X4G3-MTP.

### 3.4. I/O - Sync-cable

A Molex cable can be used as I/O sync cable:

3-pin Molex Nano-Fit -to Nano-Fit Cable Assembly

Nano-Fit Power Connectors

Nano-Fit-to-Nano-Fit Off-the-Shelf (OTS) Cable Assembly, Single Row, Matte Tin (Sn) Plating, 3 Circuits, Black

Molex series 145130: <https://www.molex.com/molex/search/partSearch?query=145130&pQuery=>

Overview: Nano-Fit Power Connectors: [https://www.molex.com/molex/products/family/nanofit\\_power\\_connectors](https://www.molex.com/molex/products/family/nanofit_power_connectors)

7.5cm	1451300300
15cm	1451300301
30 cm	1451300303
1m	1451300310

The connector on the cable is:

Nano-Fit Receptacle Housing, TPA Capable, 2.50mm Pitch, Single Row, Black, Glow-Wire Capable



With 3 Circuits Part Number: 1053071203 [https://www.molex.com/molex/products/part-detail/crimp\\_housings/1053071203](https://www.molex.com/molex/products/part-detail/crimp_housings/1053071203)

### 3.5. MTP-cables

The fiber optic MTP cables needed to properly connect the adapter and the host adapter has female connectors on both sides and has an ANSI/TIA Type-A pinout.

Available standard cables:

CBL-MTP-X4G3-FF-5M0	5.0m optical patch / trunk MTP cable, female-female, 12 fibers, ANSI/TIA Type-A
CBL-MTP-X4G3-FF-10M0	10.0m optical patch / trunk MTP cable, female-female, 12 fibers, ANSI/TIA Type-A
CBL-MTP-X4G3-FF-20M0	20.0m optical patch / trunk MTP cable, female-female, 12 fibers, ANSI/TIA Type-A
CBL-MTP-X4G3-FF-30M0	30.0m optical patch / trunk MTP cable, female-female, 12 fibers, ANSI/TIA Type-A

Please note our whitepaper on MTP cabling at <https://www.ximea.com/files/MTP-cabling-Whitepaper.pdf>

### 3.6. Power supply PSU-GSM60B24-P1J / power cord

PSU-GSM60B24-P1J is a AC-DC desktop power supply (sold separately).

Output: 24V DC at 2.5A, up to 60W: AC 2-pole IEC320-C8 inlet, OD5.5/ID2.1 DC connector

Outside  Inside

A power cord (EU or US) must be ordered separately:

CBL-PWR-C7-EU      power cord (EU) for BACS and PSU-GSM power supplies

CBL-PWR-C7-US      power cord (US) for BACS and PSU-GSM power supplies

### 3.7. HA-1P-X4G3-MTP-X8G3, MTP host adapters

A PCIe host adapter with a 12-pin MTP connector must be plugged into the computer.

XIMEA offers its own host adapter

HA-1P-X4G3-MTP-X8G3      XIMEA 1-Port PCIe Gen.3 x4 host adapter for fiber optics with opposed MTP connector

### 3.8. Sample setup

A complete setup consists of

one of the cameras

MX510XG-GP-FA-GO

MX510XG-GP-TP2:1-GO

one of the MTP cables, depending on the desired cable length

CBL-MTP-X4G3-FF-5M0

CBL-MTP-X4G3-FF-10M0

CBL-MTP-X4G3-FF-20M0

CBL-MTP-X4G3-FF-30M0

and the components

ADPT-1P-X4G3-FF-X4G3-MTP (incl. the power cable CBL-XEC2-PWR-0M15)

Firefly cable, e.g. CBL-ECUE-X4G3-0M15

Host adapter HA-1P-X4G3-MTP-X8G3

Power supply PSU-GSM60B24-P1J

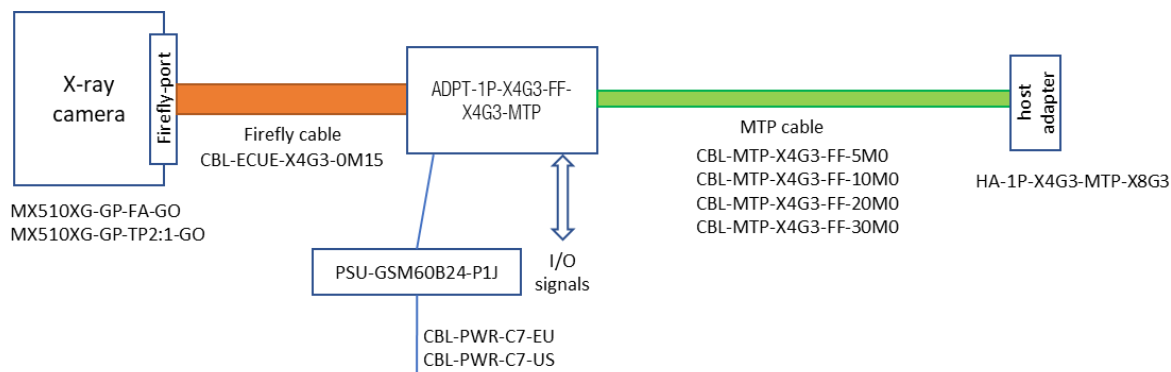
One of the power cords

CBL-PWR-C7-EU

CBL-PWR-C7-US

If needed one of the I/O sync cables (see above).

Configuration overview



## 4. Contact information

### Further information

Please visit us at [www.ximea.com](http://www.ximea.com) for complete and up-to-date specifications. Get in touch with our teams at [sales@ximea.com](mailto:sales@ximea.com). We will be glad to assist!

### Contact XIMEA

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## 5. Revision history

Version	Date	Notes
V0.01	05/11/2022	First preliminary version
V0.02	05/23/2022	Reviews processed; camera name changed (MX510XR -> MX510XG)

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