

EoSens1.1 CoaXPress12 Manual

EoSens1.1CCX12-CM, EoSens1.1CCX12-FM, EoSens1.1MCX12-CM,
EoSens1.1MCX12-FM

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General information

1.1 Company information

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1.1.1 Disclaimer

This manual contains important instructions for safe and efficient handling of our products. This manual is part of the product and must be kept accessible in the immediate vicinity of the product for any person working on or with this product .

Read carefully and make sure you understand this manual prior to starting any work with this product. The basic prerequisite for safe work is compliant with all specified safety and handling instructions.

Accident prevention guidelines and general safety regulations should be applied.

Illustrations in this manual are provided for basic understanding and can vary from the actual model of this product. No claims can be derived from the illustrations in this manual.

The product has been produced with care and has been thoroughly tested. In case of any complaint, contact your local Allied Vision distributor. You will find a list of distributors in your area on [Allied Vision Distributors](#)

1.1.2 Copyright notice

Forwarding and duplicating of this document, as well as using or revealing its contents are prohibited without written approval. All rights reserved with regard to patent claims or submission of design or utility patent.

The specification is subject to change without notice in advance. The brand and product names are trademarks of their respective companies. Any configuration other than original product specification is not guaranteed.

1.2 Legal information

Errors and omissions excepted.

These products are designed for industrial applications only. Cameras from Allied Vision Gilching GmbH are not designed for life support systems where malfunction of the products might result in any risk of personal harm or injury. Customers, integrators and end users of Allied Vision Gilching GmbH products might sell these products and agree to do so at their own risk, as Allied Vision Gilching GmbH will not take any liability for any damage from improper use or sale.

1.2.1 Registered trademarks

In this manual the following registered trademarks may be used:

- EoSens®
- GenICam®
- Microsoft® and Windows®
- Intel®

Throughout the manual, these trademarks are not specifically marked as registered trademarks. This in no way implies that these trademarks can be used in another context without the trademark sign.

1.2.2 Conformity and use

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions given in this guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will have to correct the interference at its own expense.

You are herewith cautioned that any changes or modifications not expressly approved in this description could void your authority to operate this equipment.

1.2.3

Rules and regulations for USA and Canada

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules.

It is necessary to use a shielded power supply cable. You can then use the "shield contact" on the connector which has GND contact to the device housing. This is essential for any use. If not done and the device is destroyed due to Radio Magnetic Interference (RMI) WARRANTY is void!

- Power: US/UK and European line adapter can be delivered. Otherwise use filtered and stabilized DC power supply.
- Shock & vibration resistance is tested. For detailed specifications refer to the section on specifications.

1.2.4

Warranty and non-warranty clause

The camera does not contain serviceable parts. Do not open the body of the camera. If the camera has been opened, the warranty will be void.

The camera has to be used with a supply voltage according to the camera's specification. Connecting a lower or higher supply voltage, AC voltage, reversal polarity or using wrong pins of the power connector may damage the camera. Doing so will void warranty.

Our warranty does not protect against accidental damage, loss, or acts of nature.

Allied Vision Gilching GmbH cannot be held responsible for the loss of data. We recommend a backup plan.

1.3

Supplements

FOR CUSTOMERS IN CANADA

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

POUR LES UTILISATEURS AU CANADA

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

LIFE SUPPORT APPLICATIONS

The products described in this manual are not designed for use in life support appliances or devices and systems where malfunction of these products can reasonably be expected to result in personal injury.

Allied Vision Gilching GmbH customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Allied Vision Gilching GmbH for any damages resulting from such improper use or sale.

1.4 Tips and notes

This manual contains notes that help to avoid data loss or camera damage, and tips that provide information to improve handling the camera. They are marked as follows:

TIPS

Provides information that may help to improve camera handling or avoid data loss.

NOTES

Provides information to avoid damage to the system.

1.5 Support

In case of issues with the camera we are happy to help. For being able to help you in a fast and efficient way, we ask you for a description of the issues using camera in your support request.

- Put your support request to us via the support form: [Support & Repair \(RMA\)](#)

- Fill the form with information about the camera model, the frame grabber model, and operating system. Our support team will come back to you.

Introduction

2.1 Intended use

The camera EoSens1.1 CoaXPress12 belongs to the product class of so-called high-speed machine vision (MV) cameras that are integrated into test or measurement systems.

High-speed MV cameras are designed to capture images with high frame rate for various purposes in an industrial or scientific environment to deliver image data for further analysis. The images are transmitted to a frame grabber on a connected computer where they can be evaluated with the help of a software.

OTHER USES

Any other use is regarded as unintended use and leads to the loss of guarantee and liabilities. Contact the manufacturer for other uses.

These products are designed for industrial applications only. **The cameras are not designed for life support systems where malfunction of the products might result in any risk of personal harm or injury.**

2.2 Scope of delivery

Check if the delivery is complete before installing the camera.

The firmware can be updated remotely via a special updating software. For firmware updates, inform Allied Vision Gilching GmbH by creating a support request: **Support & Repair (RMA)**.

2.3 Optional accessories

LENSES

For lenses or other accessories, visit [Lens Selector](#).

CABLES

We recommend the following cable:

- KAB-CC-CXP12-RG59-05 (12GHz µBNC RG59) - 5 m

POWER SUPPLY

If you do not use power over CXP (PoCXP), you need an external power supply unit, e.g.:

- MIK-PS-HR12-12V (12 V / 2.5 A) with 12 pin Hirose connector (HR10A-10P-12S(73)) and 1.5 m cable
- MIK-PS-HR12-BNC-12V (12 V / 2.5 A) with 12 pin Hirose connector (HR10A-10P-12S(73)) and 1.5 m cable plus additional strobe out line

2.4 System requirements

The PC or image processing system that is connected with the camera must be equipped with:

- An image processing system, e.g.: PC and operating system according to the requirements of the frame grabber
- A fully installed frame grabber with device driver and software
- CoaXPress cable with µBNC connector
- Optional external power supply (MIK-PS-HR12-12V / MIK-PS-HR12-BNC-12V)

To make use of the full performance, all cables, connectors and the frame grabber must be CoaXPress V2.0 compliant.

The camera

3.1 Camera description

All cameras of the EoSens CXP family are CoaXPress compliant. The high-speed CMOS cameras come with a 1.1 Megapixel sensor of 1280 x 864 (H x V). They are widely configurable and scalable to fit your needs and are available in monochrome and color (Bayer filter).

The CoaXPress high speed interface technology allows transfer rates of up to 12.5 Gb/s per channel. The camera supports CoaXPress Link Speeds from 3.125 Gb/s to 12.5 Gb/s at 1, 2, or 4 channels.

In addition the camera offers a very high frame rate of over 3660 fps at full resolution. By defining a Region of Interest (ROI) the frame rate can be increased to several thousand frames per second. An important feature of CXP cameras is the high photo sensitivity for low-light conditions.

The camera electronic is enclosed in a compact and solid full metal housing robust enough to comply with the requirements in heavy industrial surroundings. Shielded coaxial cables as recommended by the CoaXPress standard will support this.

CXP cameras can be equipped with standard C-mount or F-mount lenses made for industrial purpose.

The color and monochrome cameras are supplied with the following features:

- Analog/digital gain
- Black level adjustment
- FPN correction
- Image information field
- Lookup table (LUT)
- Test images
- User profiles

BAYER FILTER

The sensor of the EoSens1.1 CoaXPress12 colour cameras is supplied with a Bayer colour filter. In order to get the colour information, the imaging software has to decode the information of each pixel into red, green, and blue (RGB) by using the values of its neighbouring pixels. Each red, green and blue

filter element covers exactly one pixel on the sensor. A matrix of 2 x 2 filter elements builds a filter element matrix. A Bayer pattern image therefore must have an even number of pixels and an even number of lines.

3.1.1

CXP-12 features

CoaXPress-12 (CXP2.0) is the currently the best option regarding high speed high volume data transfer for imaging. However, as opposed to network-ready cameras, the interface requires a frame grabber on the PC side.

The CoaXPress standard includes features like power-over-CoaXPress (PoCXP) already in the standard definition.

The main advantages of CXP-12 are:

- 12.5 Gbit/s transfer rate per line
- Lines can be teamed
- Provides data and power on a single line (PoCXP)
- Thin and flexible 75 Ohm coaxial cables
- 25 m data cable supported
- Low latency times
- Uplink speed 41.6 Mbit/s
- No-latency trigger over CXP (max. 300 kHz)
- DIN µBNC connector

3.2

Operating temperature

If the camera is mounted on mechanical parts, the heat generated during operation will be dissipated by the cooling fins at the rear of the camera, and the mechanical parts.

The camera body temperature must not exceed the values specified in the technical data (see "Technical data" on page 27).

In case of overheating, the camera will automatically be switched off and the communication between camera and PC will be interrupted.

Durability of the camera will be reduced when being operated in an environment that is constantly exceeding the maximum permissible operating temperature. In this case, take additional cooling measures as described below.

The camera is not intended for use on an isolated mounting plate or in a closed housing because the temperature of the camera will rise continuously.

3.3

Cooling

During operation, the heat from the camera's sensor dissipates to the housing. To maintain reliable performance, it is crucial to adhere to the operating temperature range specified in the camera's technical data.

- Install the camera so that the housing openings at the back or at the sides are not blocked and ventilation is possible under all operating conditions.
- Check the unhindered air flow after installation of surrounding components such as cables.

ADDITIONAL COOLING

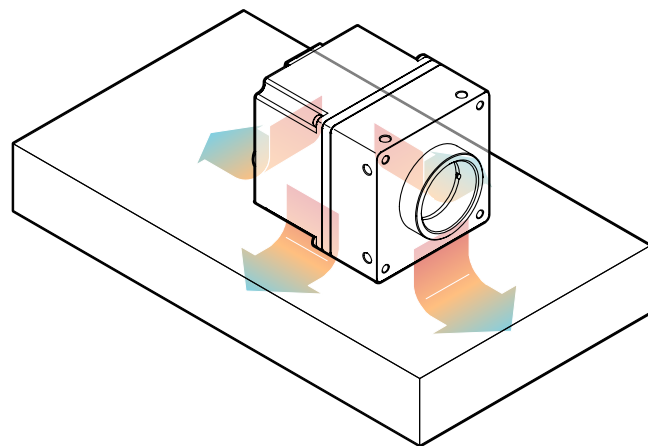


Fig. 3-1: Camera mounted to a heat sink (example)

If the temperature consistently exceeds the maximum operating temperature specified for the camera, additional cooling measures are necessary. This can be achieved by:

- Mounting the camera housing to a heat sink or other heat-dissipating material. For optimal cooling efficiency, ensure that the contact area between the camera housing and the cooling material is as large as possible, allowing for better heat transfer.
In addition, vibrations will be minimized within the entire system.
- If available, activating the built-in fan or adjust the fan control threshold.
- If available, activating the built-in thermoelectric cooling feature.
- Using an air- or water-cooling system.

Even if the housing temperature remains below the maximum operating temperature, using additional cooling is recommended to ensure optimal image quality and power efficiency.

3.4 Interfaces of the camera

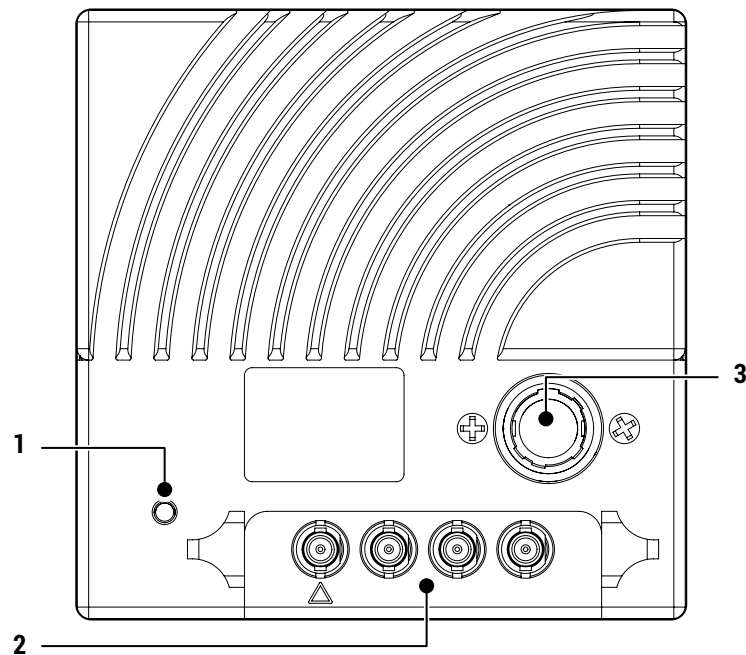


Fig. 3-2: Interfaces of the camera EoSens1.1 CoaXPress12

- 1** Status LED to verify the operating status of the camera
- 2** Four CoaXPress μ BNC connectors to connect the camera with a CoaXPress compliant frame grabber. The Δ -marked line can supply the camera with power via power over CoaxPress (PoCXP).
- 3** 12-pin Hirose power connector used when an external power supply (12 ... 24 V) has to be connected, an external trigger is connected and / or an output signal is used.

3.4.1 CoaXPress-12

The cameras support an extended CoaXPress-12 (or CoaXPress 2.0) interface with connectors and a bandwidth of up to 12.5 Gbit/s per line.

The connectors are μ BNC connectors. For cables, an impedance of 75 Ohm, RG187 is recommended. Allied Vision Gilching GmbH uses connectors according to J1A standard.

The CoaXPress standard supports camera control and power over CoaXPress (PoCXP).

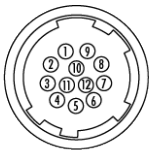
It is recommended to use the frame grabber power supply over CoaXPress (PoCXP).

3.4.2

Hirose I/O connector

The Hirose™ connector provides power, input and output signal access.

Maximum power output is max. 2 A.



Hirose Pinout

Pin	Signal ECO, ECO2, EVO, HR (CL medium, GigE only)	Signal EXO, FXO, HR (CL De., CXP), SHR	Signal 4 I/O for option ECO
1	V IN- (GND)	V IN- (GND)	V IN- (GND)
2	V IN+ (10 – 25V)	V IN+ (10 – 25V)	V IN+ (10 – 25V)
3	RxD (RS232) not available for PoE versions	IN 4 RxD (RS232)	not connected
4	TxD (RS232) not available for PoE versions	OUT 4 TxD (RS232)	not connected
5	IN 1 (0 – 24 V)	IN 1 (0 – 24 V)	IN 1 (0 – 24 V)
6	IN 2 (0 – 24 V)	IN 2 (0 – 24 V)	IN 2 (0 – 24 V)
7	OUT 1 (open drain)	OUT 1 (open drain)	OUT 1 (open drain)
8	OUT 2 (open drain)	OUT 2 (open drain)	OUT 2 (open drain)
9	IN 3+ (RS422)	IN 3+ (opto IN +)	IN 3 (0 – 24 V)
10	IN 3 – (RS422)	IN 3 – (opto IN –)	IN 4 (0 – 24 V)
11	OUT 3+ (RS422)	OUT 3 (open drain)	OUT 3 (open drain)
12	OUT 3 – (RS422)	OUT 0 (open drain)	OUT 4 (open drain)
	Shielding	Shielding	Shielding

Fig. 3-3: I/O Hirose connector layout

Type	HR10A-10R-12P
Matching connector	HR10A-10P-12S

Table: 3-1: Hirose connector types

3.5 Status LED

The multi-color status LED indicates camera and connection states.

LED State	Indication
OFF	No power
Solid orange	System is booting
Slow pulse red	Powered, but nothing connected
Fast flash alternate green/orange	Connection detection in progress, PoCXP active
Fast flash orange	Connection detection in progress
Slow flash alternate red/green	Device incompatible, PoCXP active
Slow flash alternate red/orange	Device incompatible
Solid green	Device connected but no data being transferred
Slow pulse orange	Device connected, waiting for event (e.g. trigger)
Fast flash green	Device connected, data being transferred
Slow flash alternate green/orange	Connection test packets being sent
Red - 500 ms pulse	Error during data transfer
Slow flash alternate red/green/orange	Compliance test mode enabled
Fast flash red	System error

Setting up

4.1 Connecting a frame grabber

The transmission speed of the camera can either be set to 3.125, 5, 6.25, 10, or 12.5 Gb/s. The possible cable length depends on the cable type used, its quality, and the selected transmission speed. The following table provides examples. These values will only be reached if the signal quality meets the requirements of the CXP2.0 specification.

Power is supplied via PoCXP (Power over CXP).

The maximal cable length depends also on the quality of the cables. We recommend CXP cables from Allied Vision Gilching GmbH.

CXP-Type	Transmission speed [Gb/s]	Max. cable length RG59 style [m]
CXP-6	6.25	up to 40
CXP-12	12.5	up to 30

All lines have to be of the same length.

MBNC CONNECTOR

Allied Vision Gilching GmbH offers cables with the following connectors:

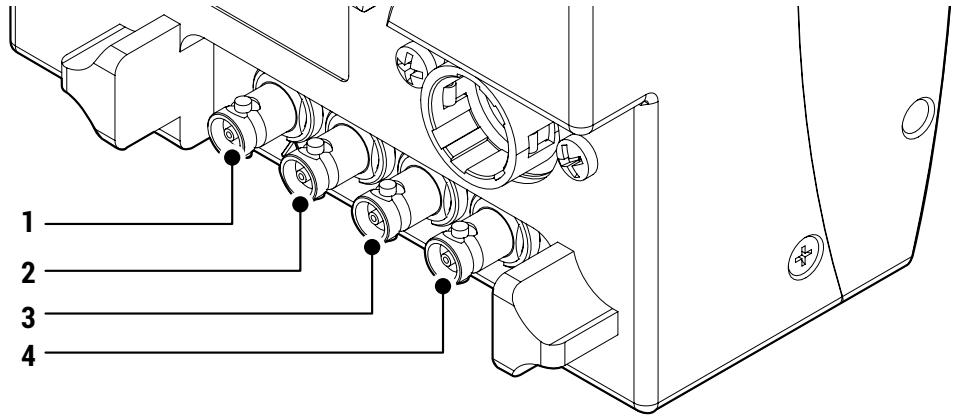
- μ BNC \leftrightarrow μ BNC (cable KKRDxxx)

Carefully connect and release the socket with the connector. Connect them precisely to avoid deformation of the connectors or other damages!

If connecting individual cables, keep the order on camera side starting at from Δ -marked link one to channel one on the frame grabber.

Pin 1 always has to be connected.

The master connector is marked by a triangle. Connect it with channel one of the frame grabber (refer to the frame grabber documentation).



The possible connector combinations are shown in the table below.

No. of connections	Connector combination
1	1
2	1+2 (link)
4	1+2+3+4 (link)

All connections are hot-pluggable.

4.2 Connecting an external power supply or I/O signals

External 12-24 V DC power supply (min. 18 W), are connected with the 12-pin connector at the rear of the camera.

The power connector of the camera has to be connected with a DC power supply providing 12 to 24 V DC. Connecting a lower or higher supply voltage, an AC voltage, reversal polarity or using wrong pins of the power connector may damage the camera and will void warranty!

Allied Vision Gilching GmbH offers the power supply unit MIK-PS-HR12-12V or MIK-PS-HR12-BNC-12V with cables of 1.5 meters.

If you assemble your own cable, pay attention to the pinning described below.

12-PIN CONNECTOR AND I/O SIGNALS

1. Connect the external power supply with the 12-pin connector of the camera.

The DC power supply must deliver 12-24 V DC (18.4 W). It must be equipped with a HR-10A-10P-12S plug.

The 12-pin connector provides two inputs for an external trigger and two output signals. The output signal can be controlled.

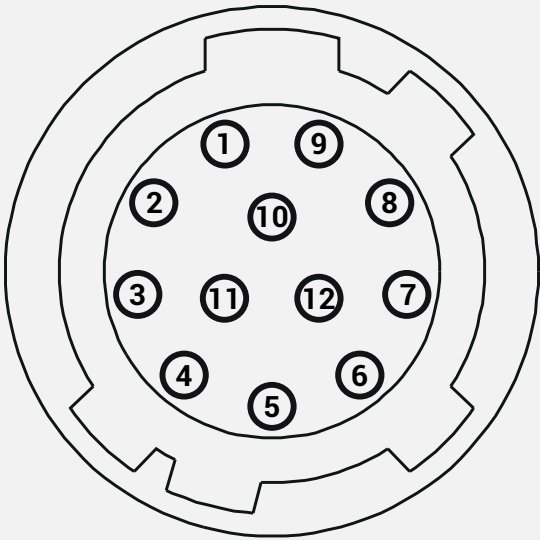
	Pin	Signal	Pin	Signal
	1 + 12	GND	6	IN0
	2 + 11	VCC (12 - 24 V)	7	IO _{GND}
	3	IO _{GND}	8	OUT1
	4	OUT0	9	IO _{GND}
	5	IO _{GND}	10	IN1

Fig. 4-1: Connecting input and output signals with the internal circuit

All inputs accept 3.3 V LVTTTL signals. They are also 5 V TTL compatible.

All inputs can also accept signals with 12 V and 24 V.

An open (not connected) input will be interpreted as low level from the camera. For high level an input voltage of >0.8 V must be connected.

The following circuit can be used for the input signals of the camera:

- At low input voltages (0 V, 3 V)
 - The Zener diode does not conduct (< 6.2 V).
 - The transistor is blocked.
 - IN_x = INPUT_USER.
- At high input voltages (24 V)
 - When the voltage across R1 exceeds the Zener voltage (6.2 V) + base-emitter voltage (0.7 V).
 - The transistor begins to conduct and limits the voltage.
- D1: BZX84C4V3 (4.3 V)
- Q1: BC547 or 2N2222 (Standard NPN)
- R2: 10 kΩ, 0.25 W
- R1: 22 kΩ, 0.25 W

4.3

Connecting camera and image processing system

To make use of the full performance, all cables, connectors and the frame grabber must be CoaXPress V2.0 compliant.

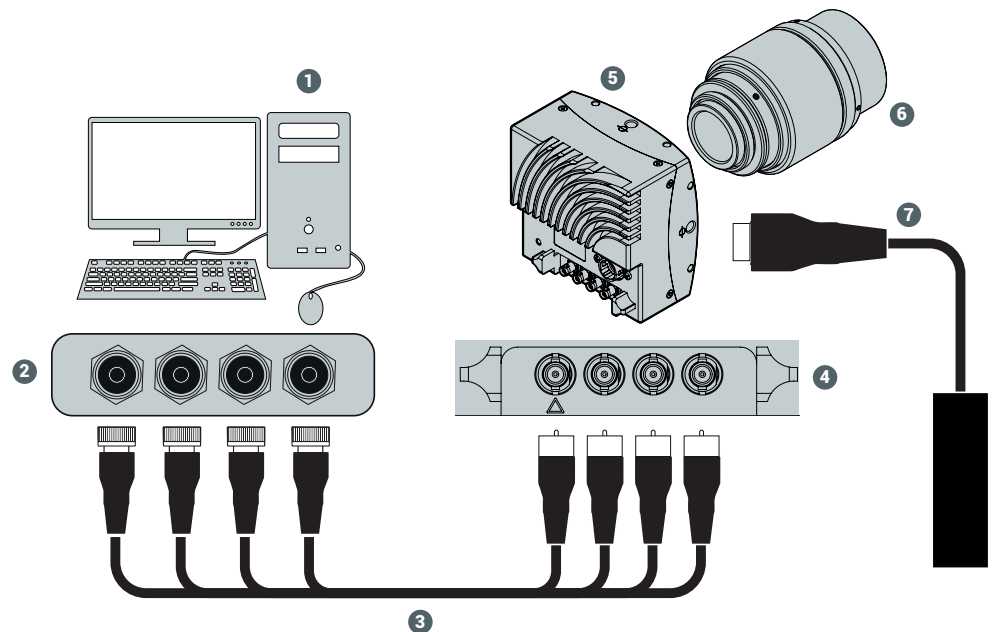


Fig. 4-2: Connecting the camera and image processing system

1. Install the frame grabber software on the image processing system (see documentation of frame grabber board).
2. Switch off the image processing system (1).
3. Unscrew the dust protection cover of the camera (5).
4. Mount the lens (6).
5. Connect the μ BNC cables (3) with the camera connectors (4).
6. Connect the other end of the cable with the frame grabber board (2).
7. If required, connect the power supply NTCAM132x via the 12-pin connector with the camera (5).

If connecting an external trigger, take the pinning into account.

8. If an external power supply (7) is used, connect the power supply with the main supply.
9. Switch on the image processing system (1).
10. Check the status LED of the camera to verify that the camera is ready for use.

4.4 Power safety

For safety reasons, for protection of the camera and users, use certified power supplies (Low power supply according IEC 62368-1) only. Refer to specifications for your camera model. Appropriate power supplies can be ordered at Allied Vision Gilching GmbH.

The camera does not have a power switch. The camera is powered on as soon power is available to the camera. This might happen via the Hirose connector or (in case of USB or CoaXPress) through the interface cables.

For making sure the camera is not connected to power

- Disconnect Hirose (or M12) plug from camera
- If the camera interface is USB or CoaXPress, disconnect interface connector from the camera
- Disconnect power plug from power AC wall outlet to disable the DC power supply as well.

The power supply must be easily accessible at all times! For Power specs, refer to the data sheet of your model.

Before connecting your camera to power, make sure your data cable is connected properly. Always connect data cable before power.

4.5 The power-up profile

If the camera is powered-up, the power-up profile permanently stored in the non-volatile memory of the camera will be loaded. This profile consists of a number of camera settings such as sensor resolution and frame rate. It is used to set the camera into a defined operation mode.

The camera has NOT to be configured by the host to start operation. The power-up profile will deliver all necessary values.

Serial number and firmware version are provided in the non-volatile memory of the camera. Use the GenICam feature "DeviceSerialNumber" to read the serial number and the firmware revision.

Read the chapter on Bootstrap Registers in the Reference Guide for more information. For the serial number, see the identification plate at the side of the camera.

4.6

Cleaning sensor and lens

1. If there are coarse particles on the lens or the window of the sensor, use a vacuum cleaner to remove them before cleaning to prevent scratches.
2. Clean the window of the sensor and the lens with a dry and soft lens-cleaning tissue.

Do not use tools that may harm the sensor or lens.

4.7

Updating the camera firmware

This section describes how to carry out a firmware update for a camera from Allied Vision Gilching GmbH using the software "CXPUdater".

PREREQUISITES

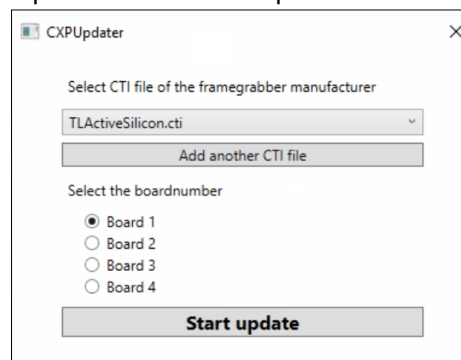
The updater software requires the Microsoft Redistributables for Visual Studio 2015-2019 (vcredist_x64.exe) that can be downloaded from Microsoft for free.

PROCEDURE

The updater process requires frame grabber specific components. The program assumes that there is a "Data" folder containing the following files:

- FlashData.ibf
- fpga_app_firmware.ibf

1. Open the tool "CXP Updater.exe" in the folder "Firmware".



2. Select the CTI file that corresponds to the frame grabber board. If unsure, consult the Device Manager.

3. To add a CTI file that is not in the list, select **Add another CTI file** and navigate to the file.
4. Select the board for updating.
5. Start the update process. The progress bar displays the current update status.

Do not switch off the camera during the update process.

6. When the update is finished, restart the camera.

Technical data

For technical data sheets visit [Documents and downloads - Technical documentation](#).

Search for a specific camera, using series and model name or by using the Allied Vision camera selector. The details and download section provides you with manuals, drawings, and certificates.



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