CoaXPress®

User Guide

EoSens® 21CXP2

Content

1 General information

1.1 Company information

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1.1.1 Standards

This manual is based on the following standards:

- DIN EN 62079
- DIN EN ISO 12100
- ISO Guide 37
- DIN ISO 3864-2
- DIN ISO 3864-4
- DIN ISO 16016:2002-5

1.1.2 Disclaimer

This manual contains important instructions for safe and efficient handling of 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 SVS-VISTEK distributor. You will find a list of distributors in your area on www.svs-vistek.com

1.1.3 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.

1.2 Legal information

Errors and omissions excepted.

These products are designed for industrial applications only. Cameras from SVS-Vistek 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 SVS-Vistek products might sell these products and agree to do so at their own risk, as SVS-Vistek will not take any liability for any damage from improper use or sale.

1.2.1 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.

NOTICE | 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 ("Specifications").

1.2.2 Europe

This device is CE tested, rules of EN 55022:2010+AC2011 and EN61000-6-2:2005 apply.

The product is in compliance with the requirements of the following European directives:

- 2014/30/EU Electromagnetic compatibility (EMC)
- 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

All SVS-VISTEK products comply with the recommendation of the European Union concerning RoHS Rules.

1.3 About this manual

This manual contains helpful information to install and operate the described camera. It has been produced with care. Nevertheless, information might be erroneous or incomplete. SVS-Vistek GmbH cannot be held responsible for any problems resulting from incomplete or erroneous information.

Read this manual carefully.

NOTICE | **This manual is subject to change without notice.**

It is intended for staff with technical qualifications who have been specially trained and have the appropriate knowledge in the field of automation technology, electrical and optical devices.

INFO | *Keep this manual for future use.*

1.3.1 Registered trademarks

In this manual the following registered trademarks may be used:

- MotionBLITZ®
- ImageBLITZ®
- Eo*Sens*®
- 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.

1.3.2 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.

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

制造说明

此设备的生产与测试依照FCC条例第15条条例，符合A类电子设备标准。产品提供在商用使用环境中的合理保护，以防止使用过程中可能涉及到的损害。

此设备会产生、使用并可发射出无线电波，如果未按照本手册中所述安装和使用，可能会对无线通信设备产生干扰。如本设备在居民区操作出现干扰等情况，用户需要自费处理。

备注：请注意，如未按照此使用说明操作而自行更改设备，那么您将无权使用本设备。

規制適合宣言 とご使用 について(米国FCC)

この機器は、FCC規則のパート15に定められたクラスAデジタル装置に関する規制要件に基づいて所定の試験が実施され、その適合が認証されています。これらの規制要件は、商業環境において機器を使用する際、有害な干渉に対する妥当な保護を提供するために設けられています。この機器は、無線周波数エネルギーを生成かつ利用するとともに、放射することもあります。このリファレンスガイドの指示に従って設置および使用が行われない場合は、無線通信に有害な干渉を引き起こす恐れがあります。この機器を住宅地で利用すると有害な干渉を起こすこともあり、その場合、使用者は自己負担において適切な対策を講じる必要があります。

注意事項：このリファレンスガイドに明示的に承認していない変更や修正を行った場合には、本製品を使用する権利が無効となることがあります。

1.3.3 Warranty and non-warranty clause

NOTICE | 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.

NOTICE | 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.

INFO | *SVS-Vistek GmbH cannot be held responsible for the loss of data. We recommend a backup plan.*

1.3.4 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, spé-cifiées dans le Règlement sur le brouillage radioélectrique.

Life support applications

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

NOTICE | SVS-Vistek GmbH customers using or selling these products for use in such applic-ations do so at their own risk and agree to fully indemnify SVS-Vistek 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 fol-lows:

Tips

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

Notes

NOTICE | 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.

1. Put your support request to us via the support form: https://www.svs-vistek.-com/en/support/svs-support-request.php
2. Fill the form with information about the camera model, the frame grabber model, and operating system. Our support team will come back to you.

2 Introduction

2.1 Intended use

The camera EoSens® 21CXP2 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

The following components are part of delivery. Before installing the camera, check if the delivery is complete:

- Camera as ordered
- F-mount lens adapter
- USB storage device with
    - GenICam XML file
    - Product documentation

NOTICE	Check if the delivery is complete before installing the camera.

INFO	*The firmware can be updated remotely via a special updating software. For firmware updates, inform SVS-Vistek GmbH via email: info@svs-vistek.com.*

2.3 Optional accessories

Lenses

Only lenses for industrial purpose are suitable. To find lenses or other accessories, visit https://www.svs-vistek.com.

Cables

For connecting the camera, the following cable must be used.

- Cable CXP 12GHz μBNC RG59 (1x) - 5m

We recommend the following cable:

- KKRDRG59UBNCUBNC05/12GX1 (12GHz μBNC RG59) - 5m

Power supply

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

- NTCAM132X (12 V/2.5 A) with 12 pin Hirose connector (HR10A-10P-12S(73) and 5 m cable
- NTCAM132XIO (12 V/2.5 A) with 12 pin Hirose connector (HR10A-10P-12S (73) and 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 (NTCAM132X/NTCAM132XIO)

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

INFO	*If a CXP V1.1 frame grabber is used, only speeds up to CXP-6 (6.25 Gb/s) can be achieved.*

3 The camera

3.1 Camera description

All cameras of the EoSens CXP family are CoaXPress compliant. The high-speed CMOS cameras come with a 21 Megapixel sensor of 5,120 x 4,096 px (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. The CXP camera supports CoaXPress Link Speeds from 3.125 Gb/s to 12.5 Gb/s.

In addition the camera offers a frame rate of over 230 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 F-mount lenses made for industrial purpose.

The colour 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 EoSens 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.

UV / IR cut filter

In addition, colour cameras are equipped with an UV / IR cut filter. Light with wavelengths between 370 nm and 670 nm will be transmitted. As CMOS sensors are susceptible to UV and IR rays outside the visible spectrum, UV / IR filter avoid blurred images and therefore improve colour images.

3.2 Operating temperature

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

NOTICE   The camera body temperature must not exceed the values specified in the technical data (see "Technical data" on page 21).

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

INFO   *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.*

NOTICE   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 Active cooling

The camera is equipped with active cooling. This can be deactivated if the camera temperature can be stabilized by other methods such as mounting on a heat-dissipating construction.

If the ambient temperature is constantly exceeding 40 °C, additional cooling is recommended.
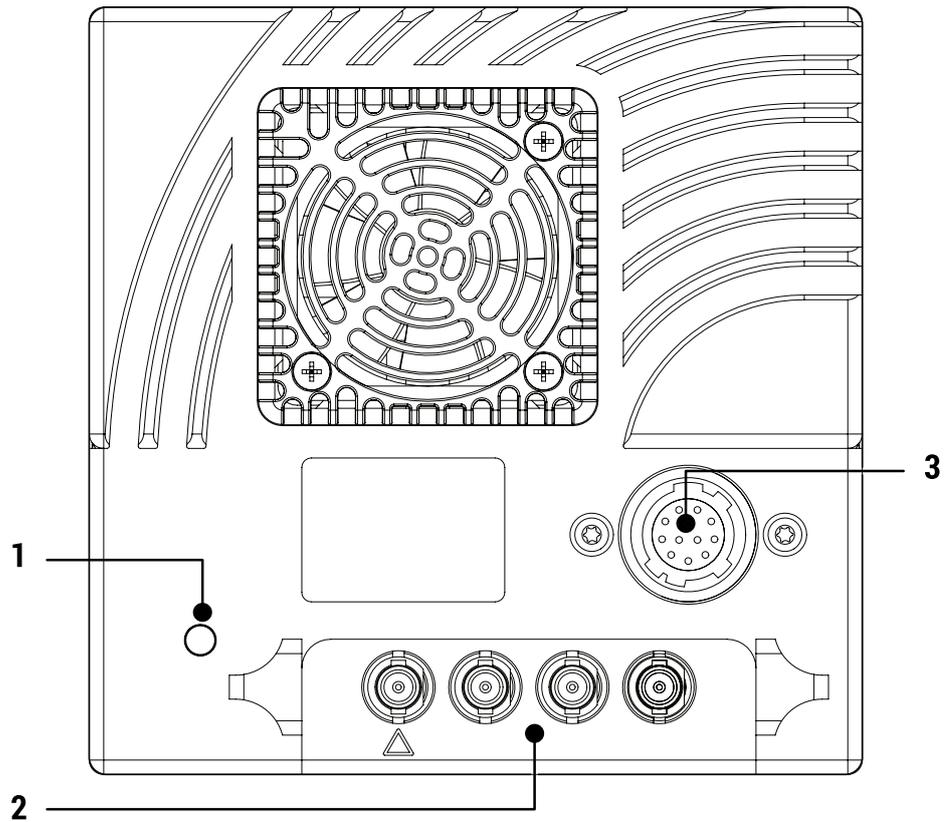
3.4   Interfaces of the camera

Fig.: 3-1: Interfaces of the camera EoSens® 21CXP2

1	Status LED to verify the operating status of the camera
2	Four CoaXPress μBNC connectors to connect the camera with a CoaXPress compliant frame grabber. The Δ-marked line can supply the camera with power via power over coax (PoC).
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.

3.5   Status LED

The multi-colourstatus LED indicates camera and connection states.

LED State	Indication
OFF	No power
Solid orange	System is booting
Slow pulse red	Powered, but nothing connected (not applicable if PoC is used)
Fast flash alternate green/orange	Connection detection in progress, PoC active
Fast flash orange	Connection detection in progress, PoC not in use
Slow flash alternate red/green	Device incompatible, PoC active
Slow flash alternate red/orange	Device incompatible, PoC not in use
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

4 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.

INFO | *To use PoCXP, lane 1 (Master) and lane 2 (Extension1) must be connected with the frame grabber.*

CXP-Type	Transmission speed [Gb/s]	Max. cable length RG59 style [m]
CXP-3	3.125	up to 100
CXP-6	6.25	up to 40
CXP-10	10	up to 40
CXP-12	12.5	up to 30

NOTICE | All lines have to be of the same length.

μBNC connector

SVS-Vistek GmbH offers cables with the following connectors:

- μBNC ⟵⟶ μBNC (cable KKRDxxx)

NOTICE | 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.

INFO | *Pin 1 always has to be connected.*

The master connector (1) is marked by a triangle. Connect it with channel one of the frame grabber (refer to the frame grabber documentation).
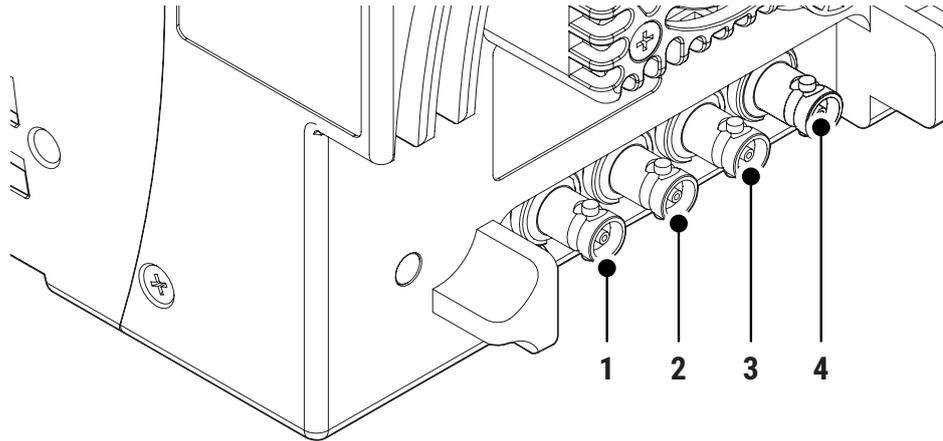
The possible connector combinations are shown in the table below.

No. of con-nections	Connector combination
1	1
2	1+2 (link)
4	1+2+3+4 (link)

INFO *All connections are hot-pluggable.*

4.2 Connecting an external power supply or I/O signals

If you prefer an external 12 - 24V DC power supply (min. 18 W), connect it with the 12-pin connector at the rear of the camera.

NOTICE **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!**

SVS-Vistek GmbH offers the power supply unit NTCAM132xx with cables of 5 or 10 meters.

INFO *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.

NOTICE **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

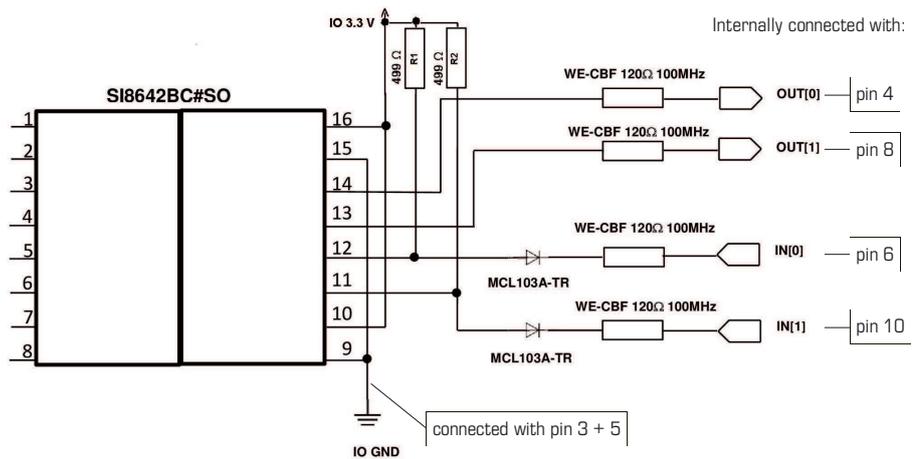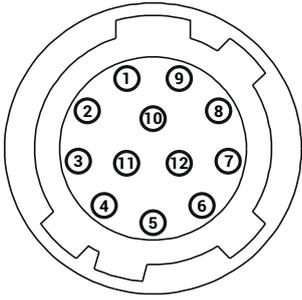
Fig.: 4-1: Connecting input and output signals with the internal circuit

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

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

NOTICE An open (not connected) input will be interpreted as high level from the camera. For low level an input voltage of 0 - 0.3V must be connected.
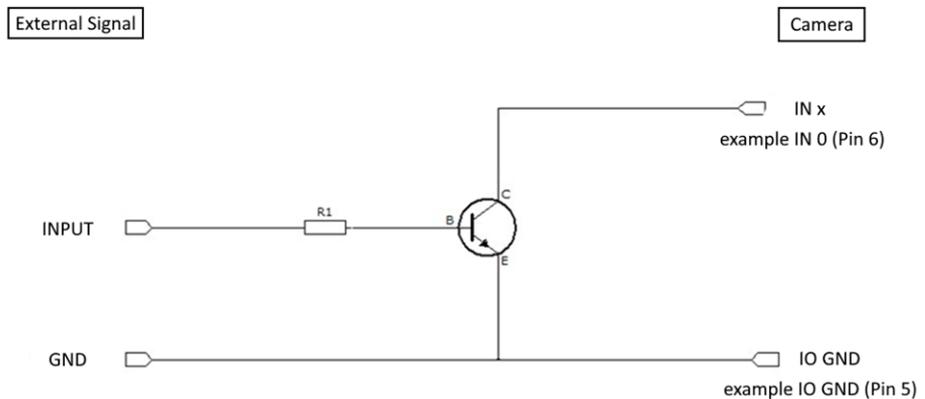

Fig.: 4-2: IO signals

If the available external signal cannot deliver a low level voltage <0.3 V or the input signal is >24 V, the following transistor circuit can be used. A suitable transistor is for example BC547, or 2N2222.

This circuit will invert the signal. (A high level at the input will be seen as low level at the camera.)

Examples for R1

Input voltage	Resistor
3.3 V	2.7 kOhm
5 V	4.7 kOhm
12 V	12 kOhm
24 V	22 kOhm

4.3 Connecting camera and image processing system

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

INFO *If a CXP V1.1 frame grabber is used, only speeds up to CXP-6 (6.25 Gb/s) can be achieved.*
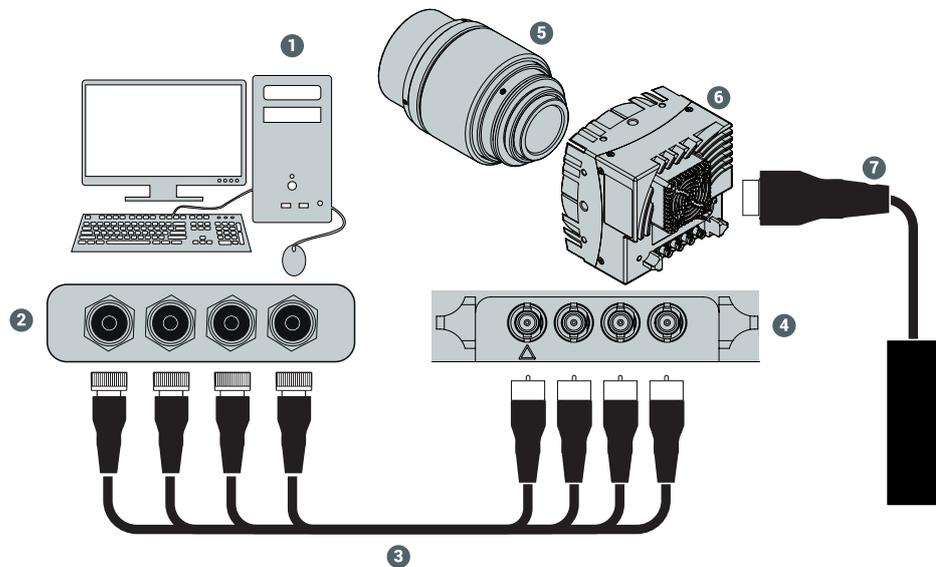

Fig.: 4-3: Connecting the camera and image processing system

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 (6).
4. Mount the lens (5).
5. Connect the μBNC 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 (6).

INFO   *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   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.

INFO   *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.

INFO   *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.*

4.5   Cleaning sensor and lens

NOTE   **Unplug the camera before you clean any parts!**
Never open the housing when cleaning the window of the sensor. If the camera has been opened, the warranty will be void.

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.

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

4.6   Updating the camera firmware

This section describes how to carry out a firmware update for a MIKROTRON camera from SVS-Vistek GmbH using the software "CXPUpdater".

Prerequisites

INFO   *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".
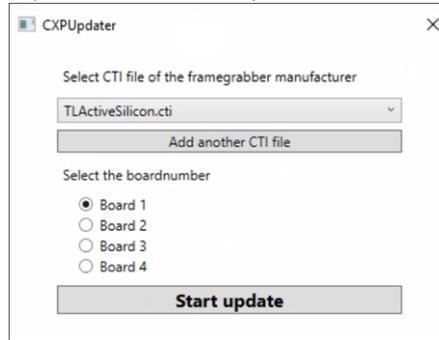
2. Select the CTI file that corresponds to the frame grabber board. If unsure, consult the Device Manager.
3. To add a CTI file that is not in the list, select **Add another CTI file** and navigate to the file.
4. Select the board for updating.
5. Start the update process. The progress bar displays the current update status.

NOTICE   Do not switch off the camera during the update process.

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

5 Technical data

5.1 Camera specifications 21 CXP2

Frame rate (8 bit)	>230 fps
Shutter speed	$4\,\mu s$ – 1 s
Shutter time (steps)	$1\,\mu s$
Max. Jitter via CXP Trigger	±4 ns
Quantum efficiency	>62% @ 500 nm
Interfaces	• CoaXPress 1.x @ 3.125 Gb/s • CoaXPress 1.x @ 6.25 Gb/s • CoaXPress 2.x @ 10 Gb/s • CoaXPress 2.x @ 12.5 Gb/s • CoaXPress lanes switchable to 1, 2, or 4 Frame rates of 12.5 Gb/s can only be reached when the camera is connected to a system that supports CXP2. Otherwise, frame rates of up to 6.25 Gb/s are possible.
Adapter	F-mount
Dimensions (W x H x L)	• 80 x 80 x 72.8 mm (without lens adapter) • 80 x 80 x 92.8 mm (F-mount)
Weight	• 0.50 kg (without lens adapter) • 0.63 kg (F-mount)
Cooling	Fan
Noise of fan	max. 23 dB(A)
Power supply	12 - 24 V DC
Operating temperature (camera body)	$+5\,°C ... +50\,°C$
Shock resistance	70 g
Vibration resistance	7 grms
Compliance	GenICam CoaXPress 1.1 / 2.0

5.2 Sensor specifications 21CXP2

Sensor type	CMOS global shutter
Image sensor size	23.04 x 18.432 mm
Resolution	21 Megapixel
Active pixels	5,120 x 4,096 px
ROI min	128 x 32 px
Pixel depth	8 bit / 10 bit / 12 bit
Pixel size	4.5 x 4.5 µm
Light sensitivity	TBD
Dynamic range up to	68.8 dB (12 bit Gain 2)
Full well charge	28,000 e- (12 bit Gain 0) 16,500 e- (12 bit Gain 2)
Bayer filter pattern	BayerGR8 / BayerGR10 / BayerGR12 Because the pattern must always start at the same field with a colourcamera only even height and even offset-y is possible. The camera will automatically round down if odd values are entered. Also bear in mind when using the invert readout function the pattern must be inverted too.

5.3 Resolution and frame rates

Resolution	Frame rate (4 x CXP-12 @ 8 bit centered)
5120 x 4096 px	230 fps

INFO   *Use our camera compare tool to calculate the frame rate for a certain ROI size:*
         www.mikrotron.de/cameracompare/

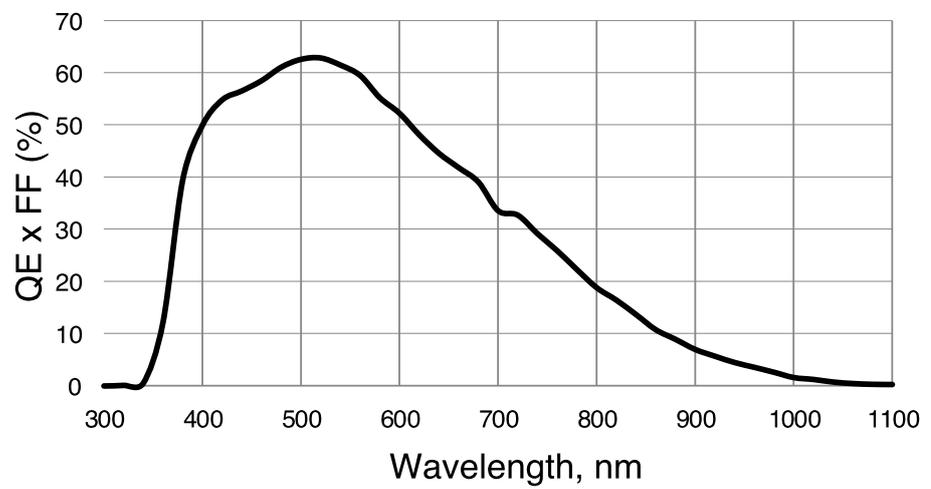## 5.4 Spectral response

5.4.1 Monochrome 21CXP2

Fig.: 5-1: Spectral response - monochrome

6 Annex

6.1 Dimensions

INFO
> *All length units in mm.*
> *Find the technical drawings in the web download area at*
> *https://www.svs-vistek.com/en/support/svs-support-download-center.php*

CAD step files available with valid login at SVS-VISTEK.com

6.2 FAQ

INFO
> *For questions and issues, refer to the FAQ page on our website: https://www.svs-vistek.com/de/support/svs-svcam-faq.php*

6.3 Glossary

Term	Definition
Aberration	Spherical aberration occurs when light rays enter near the edge of the lens; chromatic aberration is caused by different refractive indexes of different wavelengths of the light. (Blue is more refractive than red)
ADC	Analogue-to-Digital Converter, also known as A/D converter
Aperture	In optics, aperture defines a hole or an opening through which light travels. In optical system the aperture determines the cone angle of a bundle of rays that come to a focus in the image plane. The aperture can be limited by an iris, but it is not solely reliant on the iris. The diameter of the lens has a larger influence on the capability of the optical system.
Bayer Pattern	A Bayer filter mosaic or pattern is a colour filter array (CFA) deposited onto the surface of a CCD or CMOS sensor for capturing RGB colour images. The filter mosaic has a defied sequence of red, green and blue pixels such that the captured image can be transported as a monochrome image to the host (using less bandwidth), whereafter the RGB information is recombined in a computer algorithm.
Binning	Binning combines the charge from two (or more) pixels to achieve higher dynamics while sacrificing resolution.
Bit-Depth	Bit-depth is the number of digital bits available at the output of the

Term	Definition
	Analog-to-Digital Converter (ADC) indicating the distribution of the darkest to the brightest value of a single pixel.
Camera Link	Camera Link is a multiple-pair serial communication protocol standard [1] designed for computer vision applications based on the National Semiconductor interface Channel-link. It was designed for the purpose of standardizing scientific and industrial video products including cameras, cables and frame grabbers.
CCD	Charge Coupled Device. Commonly used technology used for camera sensors used to detect & quantify light, i.e. for capturing images in an electronic manner.
CMOS	Complementary Metal–Oxide–Semiconductor. A more recently adopted technology used for camera sensors with in-pixel amplifiers used to detect & quantify light, i.e. capturing images in an electronic manner.
CPU	Central processing unit of a computer. Also referred to as the processor chip.
dB	Decibel (dB) is a logarithmic unit used to express the ratio between two values of a physical quantity.
Decimation	For reducing width or height of an image, decimation can be used (CMOS sensors only). Columns or rows can be ignored. Image readout time is thereby reduced.
Defect map	Identifies the location of defect pixels unique for every sensor. A factory generated defect map is delivered and implemented with each camera.
Defect map	Identifies the location of defect pixels unique for every sensor. A factory generated defect map is delivered and implemented with each camera.
EPROM	Erasable Programmable Read Only Memory is a type of memory chip that retains its data when its power supply is switched off.
Gain	In electronics, gain is a measure of the ability of a two-port circuit (often an amplifier) to increase the power or amplitude of a signal from the input to the output port by adding energy to the signal.
Gamma	Gamma correction is a nonlinear operation used to code and decode luminance values in video or still image systems.
GenICam	Provides a generic programming interface for all kinds of cameras and devices. Regardless what interface technology is used (GigE Vision, USB3 Vision, CoaXPress, Camera Link, etc.) or which features are implemented, the application programming interface (API) will always be the same.

Term	Definition
GigE Vision	GigE Vision is an interface standard introduced in 2006 for high-performance industrial cameras. It provides a framework for transmitting high-speed video and related control data over Gigabit Ethernet networks.
GPU	Graphics Processing Unit of a computer.
Hirose	Cable connectors commonly used for power, triggers, I/Os and strobe lights
ISO	see "Gain" on the previous page
Jumbo frames	In computer networking, jumbo frames are Ethernet frames with more than 1500 bytes of payload. Conventionally, jumbo frames can carry up to 9000 bytes of payload. Some Gigabit Ethernet switches and Gigabit Ethernet network interface cards do not support jumbo frames.
Mount	Mechanical interface / connection for attaching lenses to the camera.
Multicast	Multicast (one-to-many or many-to-many distribution) is an Ethernet group communication where information is addressed to a group of destination computers simultaneously. Multicast should not be confused with physical layer point-to-multipoint communication.
Partial Scan	A method for reading out fewer lines from the sensor, but "skipping" lines above and below the desired area. Typically applied to CCD sensors. In most CMOS image sensors an AOI (area of interest) or ROI (region of interest) can be defined by selecting the area to be read. This leads to increased frame rate.
Pixel clock	The base clock (beat) that operates the sensor chip is. It is typically also the clock with which pixels are presented at the output node of the image sensor.
PWM	Pulse width modulation. Keeping voltage at the same level while limiting current flow by switching on an off at a very high frequency.
RAW	A camera RAW image file contains minimally processed data from the image sensor. It is referred as "raw". SVS-VISTEK plays out RAW only.
Read-Out-Control	Read-Out control defines a delay between exposure and image readout. It allows the user to program a delay value (time) for the readout from the sensor. It is useful for preventing CPU overload when handling very large images or managing several cameras on a limited Ethernet connection.

Term	Definition
Shading	Shading manifests itself a decreasing brightness towards the edges of the image or a brightness variation from one side of the image to the other. Shading can be caused by non-uniform illumination, non-uniform camera sensitivity, vignetting of the lens, or even dirt and dust on glass surfaces (lens).
Shading correction	An in-camera algorithm for real time correction of shading. It typically permits user configuration. By pointing at a known uniform evenly illuminated surface it allows the microprocessor in the camera to create a correction definition, subsequently applied to the image during readout.
Shutter	Shutter is a device or technique that allows light to pass for a determined period of time, exposing photographic film or a light-sensitive electronic sensor to light in order to capture a permanent image of a scene.
Strobe light	A bright light source with a very short light pulse. Ideal for use with industrial cameras, e.g. for "freezing" the image capture of fast moving objects. Can often be a substitute for the electronic shutter of the image sensor. Certain industrial cameras have dedicated in-camera output drivers for precisely controlling one or more strobe lights.
Tap	CCD sensors can occur divided into two, four or more regions to double / quadruple the read out time.
TCP/IP	TCP/IP provides end-to-end connectivity specifying how data should be packed, addressed, transmitted, routed and received at the destination.
Trigger modes	Cameras for industrial use usually provide a set of different trigger modes with which they can be operated. The most common trigger modes are: ▪ Programmable shutter trigger mode. Each image is captured with a pre-defined shutter time; ▪ Pulse-Width Control trigger. The image capture is initiated by the leading edge of the trigger pulse and the shutter time is governed by the width of the pulse; ▪ Internal trigger or free-running mode. The camera captures images at the fastest possible frame rate permitted by the readout time.
USB3 Vision	The USB3 Vision interface is based on the standard USB 3.0 interface and uses USB 3.0 ports. Components from different manufacturers will easily communicate with each other.
XML Files	Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format which is both human-readable and machine-readable.