MIKROTRON

a **TKH Vision** brand

C⟨P-12

Manual EoSens9.5 CoaXPress12

EoSens9.5CCX12-FF, EoSens9.5CCX12-M58, EoSens9.5MCX12-FF, EoSens9.5MCX12-M58

SVS-VISTEK

A **TKH** TECHNOLOGY COMPANY ‹

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1.1   Company information

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1.1.1   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

1.1.2   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 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 Registered trademarks

In this manual the following registered trademarks may be used:

- 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.

1.2.2 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.

NOTICE
> 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.

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!

- Shock & vibration resistance is tested. For detailed specifications refer to the section on specifications ("Specifications").

1.2.4 Rules and regulations for Europe

This device is CE tested, the following rules apply:

- EN 55032:2015
- EN 61000-6-2:2019

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

- 2011/65/EU
- 2015/863/EU

All products of SVS-Vistek GmbH comply with the recommendation of the European Union concerning RoHS rules.

1.2.5 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 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.

NOTICE	SVS-Vistek GmbH customers using or selling these products for use in such applications 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 follows:

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.

- Put your support request to us via the support form: https://mik-rotron.de/en/support/mik-support-request.php
- 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 EoSens9.5 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

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 by creating a support request: https://mikrotron.de/en/support/mik-support-request.php.*

2.3 Optional accessories

Lenses

For lenses or other accessories, visit https://www.svs-vistek.com.

Cables

We recommend the following cable:

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

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

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

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 9.5 Megapixel sensor of 4096 x 2304 px (H x V). They are widely configurable and scalable to fit your needs and are available in monochrome (Bayer Filter).

The CoaXPress high speed interface technology allows transfer rates of up to 50 Gb/s when using all four lanes.

In addition the camera offers a frame rate of over 509 fps at full resolution. By defining a Region of Interest (ROI) the frame rate can be increased to several thousand frames per second.

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 M58 and flat-front lenses made for industrial purpose.

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

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

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 18).

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   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.
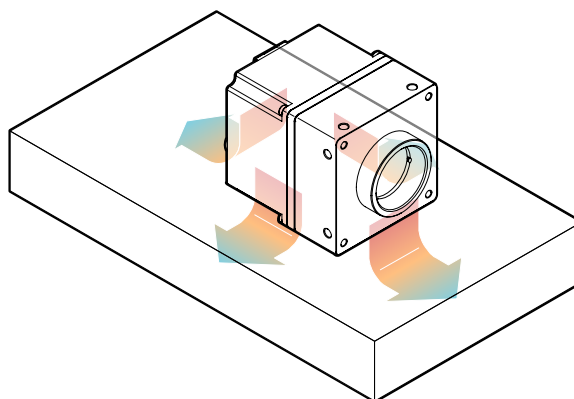
Additional cooling

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.

INFO   *Even if the housing temperature remains below the maximum operating tem-*
perature, using additional cooling is recommended to ensure optimal image
quality and power efficiency.
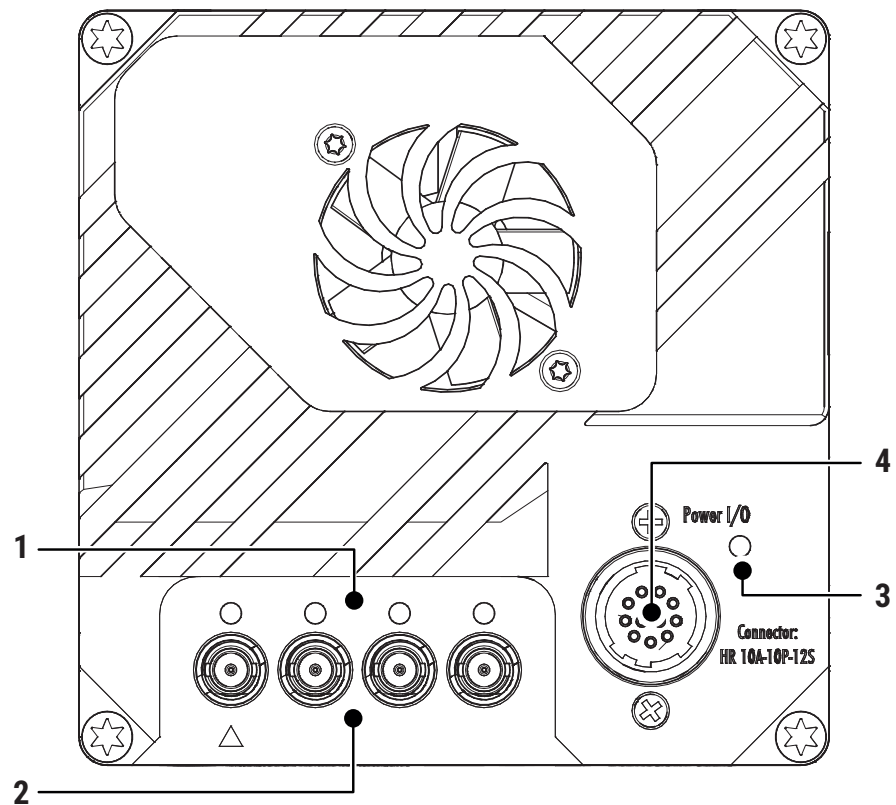
3.4   Interfaces of the camera

Fig. 3-2: Interfaces of the camera EoSens9.5 CoaXPress12

1	Status LEDs to verify the operating status of the camera for each lane.
2	Four CoaXPress μBNC connectors to connect the camera with a CoaXPress compliant frame grabber. The $\triangle$-marked line can supply the camera with power via power over CoaxPress (PoCXP).
3	Status LED to verify the operating status of the Hirose power connector.
4	12-pin Hirose power connector Power output with 24V; an external trigger is connected and / or an output signal is used.

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
Fast flash alternate green/orange	Connection detection in progress, PoCXP active
Slow flash alternate red/green	Device incompatible, PoCXP active
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 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).

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

CXP-Type	Max. cable length RG59 style [m]
CXP-12	up to 30

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.
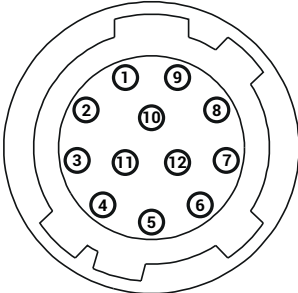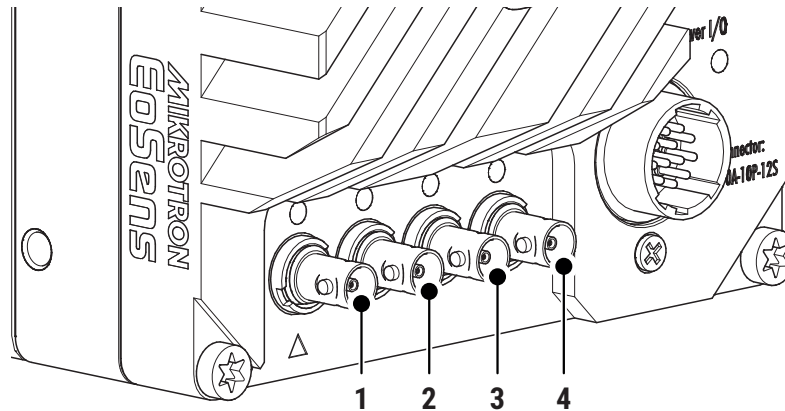

The master connector (1) is marked by a triangle. Connect it with channel one of the frame grabber (refer to the frame grabber documentation).

4.2 Connecting I/O signals

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

12-pin connector and I/O signals

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	V_{out}- (GND)	7	OUT 1 (open drain)
	2	V_{out}+ (24 V)	8	OUT 2 (open drain)
	3	IN 4 RxD (RS 232)	9	LVDS Input P
	4	OUT 4 TxD (RS 232)	10	LVDS Input N
	5	IN 1 (0-24 V)	11	LVDS Output P
	6	IN 2 (0-24 V)	12	LVDS Output N

INFO   *For electrical characteristics of the LVDS in/out connections, refer to the LVDS specifications (TIA/EIA-644-1995, http://www.jedec.org/sites/default/files/docs/jesd8-13.pdf).*

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.

I/O driver circuit schematics

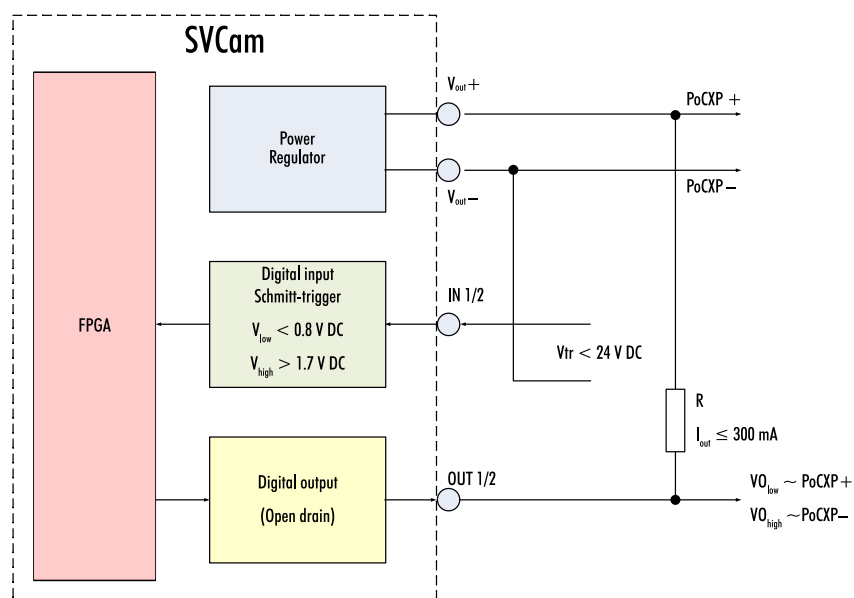Camera power supply and power supply for PWM out is 25V max., both being camera outputs.

Fig. 4-1: I/O driver circuit schematics

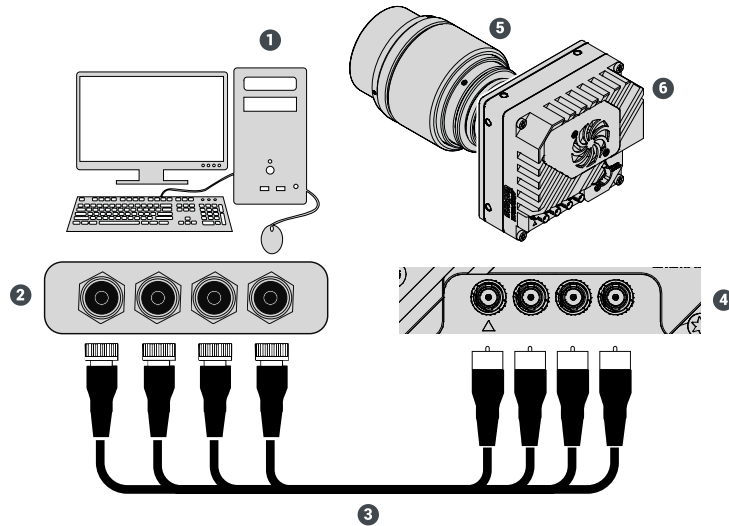## 4.3 Connecting camera and image processing system

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

- Install the frame grabber software on the image processing system (see doc-
  umentation of frame grabber board).
- Switch off the image processing system (1).
- Unscrew the dust protection cover of the camera (6).
- Mount the lens (5), if required.
- Connect the µBNC cables (3) with the camera connectors (4).
- Connect the other end of the cable with the frame grabber board (2).

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

- Switch on the image processing system (1).
- 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 num-
ber 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.

4.5   Cleaning sensor and lens

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.

- 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.
- 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.

5   Technical data

For technical data sheets visit
https://mikrotron.de/en/high-speed-cameras/mik-camera-search.php

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

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