Allied Vision

CAMERA Link™

100 GiGE VISION™ +RDMA

Manual EoSens3.0 Camera Link

EoSens3.0MCL-CM, EoSens3.0MCL-FM

A TKH TECHNOLOGY COMPANY

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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 ourproducts. 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

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.

> 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 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 Allied Vision Gilching Gmbh comply with the recommendation of the European Union concerning RoHS rules.

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 EoSens3.0 Camera Link 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.

Cable

- KKRDCLSRxx: CameraLink cables with lengths from 0.5 to 8 m are available.

> If the cable length exceeds 8m, high-quality cables are required.

In order to use Full camera link, two cables for each camera are needed.

Power supply

- NTCAM13xx: The 12V/2.5A power supply is available with 5 or 10 m cable.
- NTCAM13xxSTR with strobe connector: The 12V / 2.5 A power supply with strobe connector is available with 5 or 10 m cable.

Adapter

- F-mount adapter
- C-mount adapter

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 the most recent device driver and software
- A CameraLink cable (one cable for BASE mode or two cables for operating in FULL mode)

- An external power supply providing an output voltage between 8 and 24 V and a current of at least 2 A (e.g. NTCAM13xx or NTCAM13xx10)

The camera

3.1 Camera description

The CMOS 3.0 Megapixel CameraLink cameras offer a high photo sensitivity and therefore make inspection in low light conditions possible. Both BASE and FULL mode cameras are available as monochrome and color version.

CameraLink cameras comply with the CameraLink standard. The camera link standard defines the following items:

- Three configuration types BASE, MEDIUM and FULL with different data transfer speeds
- The transfer protocol which is used by the frame grabber to communicate with the camera.

For detailed information about the CameraLink standard, refer to the AIA web page: www.visiononline.org.

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

- 3D image smoothing
- Auto exposure
- Firmware updates on site possible
- FPN correction
- Multiple pixel exposure
- Test image

Bayer filter

The sensor of the EoSens3.0 Camera Link 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.

3.2 Operating temperature

Despite of its high performance, the fanless 3CL camera is compact and works silently. 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 23).

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

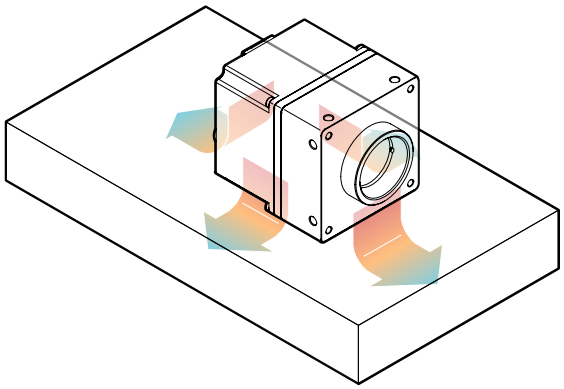

Fig. 3-1: Camera mounted to a heat sink (example)

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

At the rear of the camera, two CL sockets are provided. If only BASE is connected with the frame grabber, a maximal data transfer speed of 255 MB/s can be reached. If the connectors BASE and FULL are connected via two cables with the frame grabber, the data transfer speed amounts to 680 MB/s.

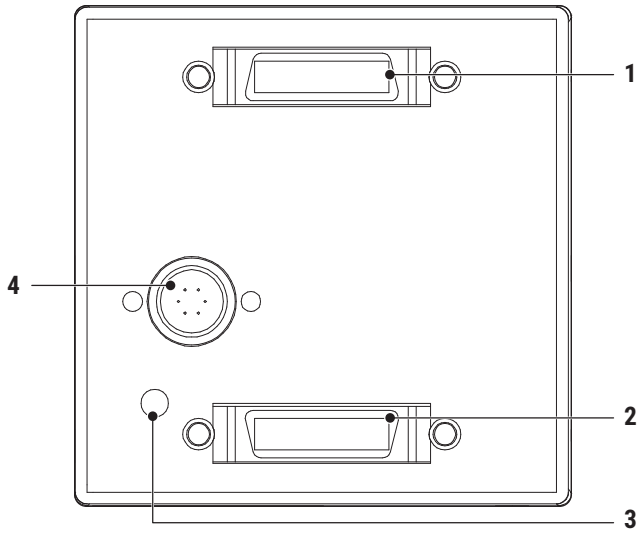

Fig. 3-2: Interfaces of the camera EoSens3.0 Camera Link

1	FULL interface	**2**	BASE interface
3	LED	**4**	6-pin Hirose socket

This connection allows a standardized real-time communication between frame grabber and camera via the standardized CameraLink machine vision protocol.

The 6-pin Hirose connector is used to connect an external power supply.

3.5 Status LED

The multicolor status LED indicates camera and CL 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
Fast flash red	System error

Setting up

4.1 Connecting power and I/O signals

The power connector of DC power supply must be connected to the 6-pin Hirose plug (HR10A-7P-6S).

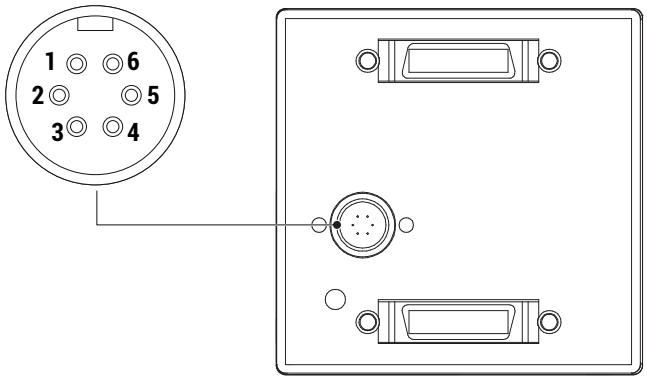

Fig. 4-1: Power connector pinning

> If it is connected with another 12 - 24 V/2A power supply, take the pinning of the connector into account.

Pin	Signal	Pin	Signal
1	V_{CC}	**2**	V_{CC}
3	$STRB_{OUT}$	**4**	GND_{STRB}
5	GND	**6**	GND

> Before applying power, verify the polarity of the leads (+/-) and whether the applied voltage is correct.

Pin 3 of the 6-pin connector provides a strobe signal ($STRB_{OUT}$) which is high during exposure.

Internally, the STRB signal of pin 3 ($STRB_{OUT}$) is connected with an optocoupler.

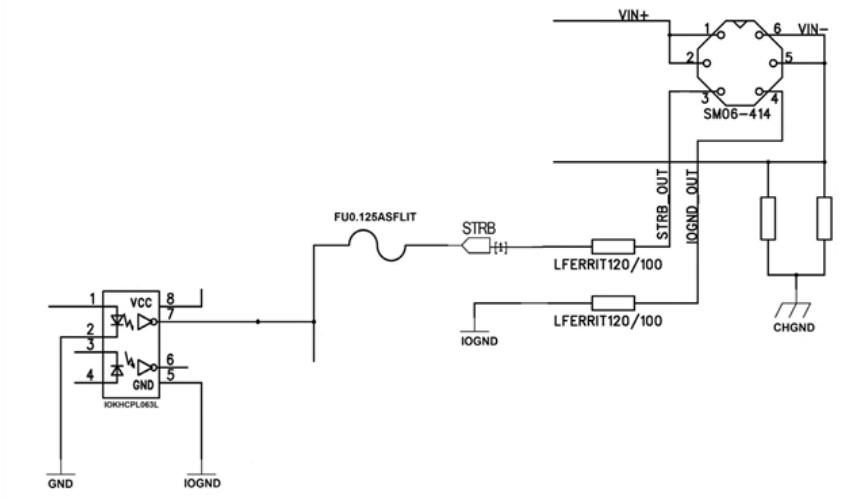

Fig. 4-2: Optocoupler

The camera must be used with a supply voltage according to the camera specification. Connecting a lower or higher supply voltage, AC voltage, reversal polarity or using wrong pins of the power connector may damage the camera. If doing so, the warranty will expire immediately.

4.2 Connecting camera and image processing system

Before you start, make sure that all components of the camera-host chain, i.e. camera, connectors, cables, and frame grabber as well as the software are CameraLink-compliant.

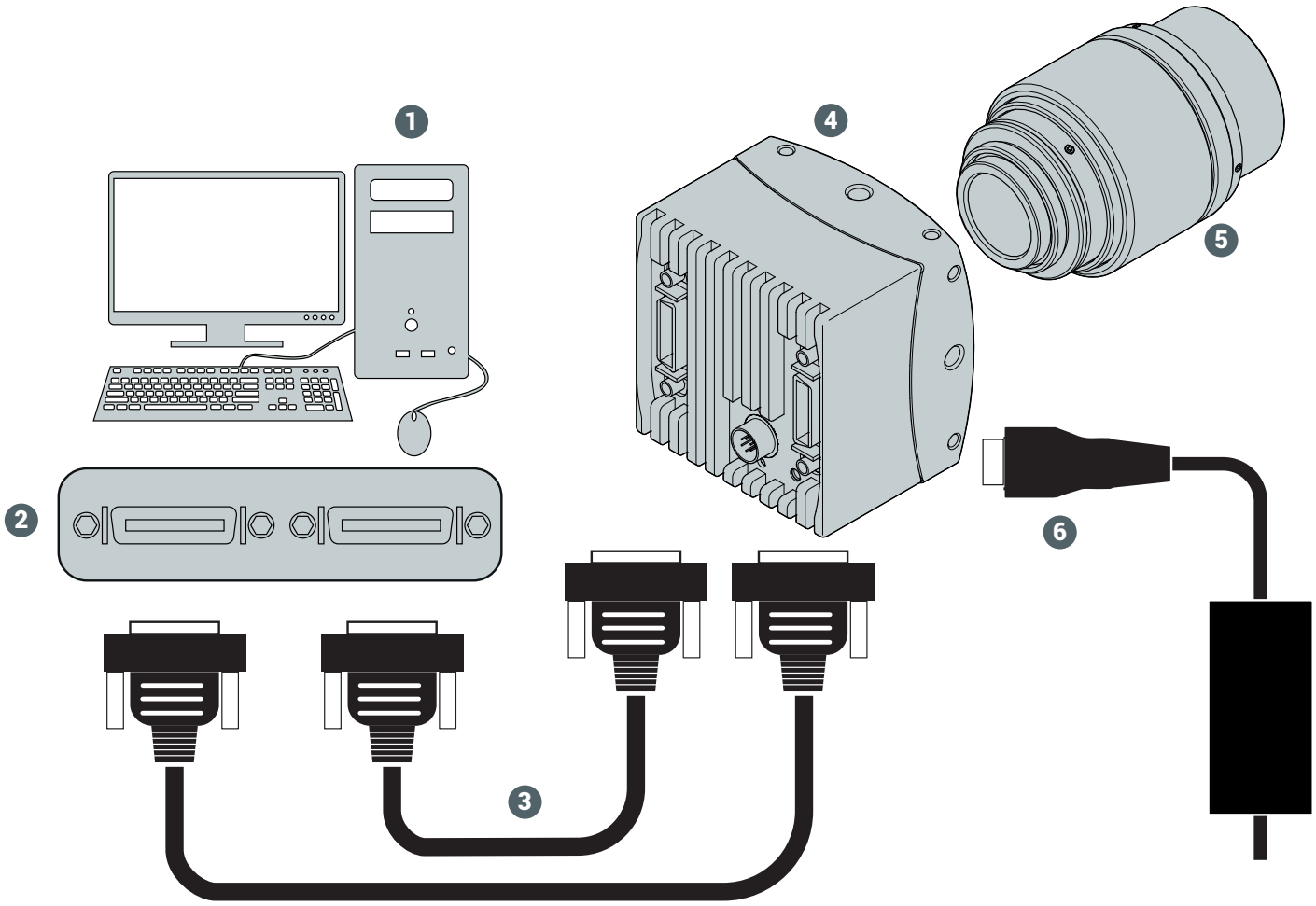

Fig. 4-3: Connecting camera and image processing system

1. Switch off the image processing system (1).
2. Connect the BASE connector of the camera (4) with the BASE connector of the frame grabber (2).
3. For FULL CL, connect the FULL connector of the camera (4) with the FULL connector of the frame grabber (2).

> Do not connect a FULL connector with a BASE connector. Otherwise communication between camera and frame grabber cannot be established.

4. Connect the external power supply with the Hirose connector (6) of the camera (4).
5. To connect a $STROBE_{OUT}$ (SYNC), take the pinning into account.
6. Unscrew the dust protection cover of the camera.
7. Mount the lens (5).
8. Connect the power supply with the main supply.
9. Switch on the image processing system (1).
10. Check the LED of the camera to verify that the camera is ready for use.

4.3 Camera settings and profiles

The 3CL camera provides several registers. The content of a complete camera register set is called a profile. All values in a register are given in hexadecimal notation (e.g.: 0xff = 255). The non-volatile memory provides space for 17 profiles:

- One power-up profile
- Eight user profiles
- Eight factory profiles

> The camera does not have to be configured via the serial link to start operation as the power-up profile will deliver all values to bring the camera into a defined operation mode.

In addition, there is one camera profile in the volatile part of the memory. If the camera is powered-up, the power-up profile, which is permanently stored in the non-volatile memory of the camera, will be loaded into the volatile camera profile.

Any change of a specific register via the serial interface is immediately processed and written into the camera profile. Its content will be lost as soon as power is switched off.

If you want to keep your changes, they have to be stored into one of the profiles of the non-volatile memory.

Profile	Video data width [MB/s]	Resolution [Pixel]	Image frequency [fps]	Mode	Pixel clock [MHz]
c	593	1280x1024	452	8x8	80

The eight user profiles are predefined with the following values:

Profile no.	Video data width [MB/s]	Resolution [pixel]	Image frequency [fps]	Mode	CL config.	Pixel clock [MHz]
0	273	200x200			FULL	75
1	400	320x240			FULL	75
2	460	640x480		8x8	FULL	80
3	593	1280x1024		8x8	FULL	80
4	630	1696x1710			FULL	80
5	557	640x480			FULL	75

Profile no.	Video data width [MB/s]	Res-olution [pixel]	Image fre-quency [fps]	Mode	CL con-fig.	Pixel clock [MHz]
6	687	1280x1024	524	10x8	FULL	75
7	710	1680x1710		10x8	FULL	75

All values can be changed by using a load/write command.

In contrary to the user profiles, the eight factory profiles cannot be changed. They deliver preset settings as described below and can be loaded with a read command.

Profile no.	Video data width [MB/s]	Res-olution [pixel]	Image fre-quency [fps]	Mode	CL con-fig.	Pixel clock [MHz]
0	273	200x200			FULL	75
1	400	320x240			FULL	75
2	460	640x480		8x8	FULL	80
3	593	1280x1024		8x8	FULL	80
4	630	1696x1710			FULL	80
5	557	640x480			FULL	75
6	687	1280x1024	524	10x8	FULL	75
7	710	1680x1710		10x8	FULL	75

4.4 Changing the pixel clock

If for example fiber repeaters are used, the cameras pixel clock will have to be decreased or set to a specific value. Otherwise it might not work properly. In order to change the pixel clock, the camera's power-up profile has to be adjusted.

Preparation

1. Download and install the 64 bit version of the MC Control Tool.
2. Close the Director2 application if running and make sure the camera is correctly connected.
3. Changing the pixel clock with the software

4. Start the MC Control Tool and connect the camera (software).
5. Click the MISC tab and select “factory profile 7” from the “Load profile” selection.
6. Click “Load”.
7. After the profile is loaded, click the Image Control tab.

Changing the pixel clock

> After loading the factory profile, do not change other settings than the ones described below.

1. Switch the tab mode to 10 x 8.
2. Select the pixel clock.
3. Click the MISC tab.
4. Select the “power up profile” from the “Save actual profile” selection.
5. Click “Save”. The camera will now start with the selected pixel clock.
6. Close the MC Control Tool.

4.5 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.

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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