Goldeye

Technical Manual

Allied Vision GigE Vision SWIR Cameras

V 1.3.0

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Allied Vision Technologies GmbH
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Allied Vision

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Table of Contents

Customer assistance

This chapter includes Allied Vision contact data for:

- Technical information and support
- Ordering
- Obtaining commercial information

Additional documentation

For more information on hardware and software refer to the following manuals and web pages on the Allied Vision website.

www

GigE camera and driver features:

For detailed information on camera controls, read the *Allied Vision GigE Features Reference* document. It is available on the Allied Vision Technical Papers and Knowledge Base web page, and describes the standard and advanced camera controls for GigE cameras as seen from the *Vimba Viewer* or GenICam compliant 3rd-party software solutions.

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

GigE Installation Manual:

The *GigE Installation Manual* describes the hardware installation procedures for allied Vision GigE cameras. Additionally, it includes safety instructions, pin assignments on I/O connectors, and GigE port connectors.

The document is available on the Allied Vision Technical Papers and Knowledge Base web page:
http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Software download:

The *VIMBA SDK* and *Acquire Control* software packages applicable to Goldeye G cameras can be downloaded from the Allied Vision software website (including documentation and release notes):
http://www.alliedvision.com/en/support/software-downloads.html.

Support

www

Technical information and support:

To obtain further technical information and request technical support, use the link on the **Allied Vision website** below:

- http://www.alliedvision.com/en/contact.html

If you are a registered customer you may also contact **Allied Vision support** via e-mail:

- support@alliedvision.com

Contact addresses

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Accessories available

Below you find a selection of essential accessories to get your Allied Vision camera up and running quickly.

These accessories are also listed in the appropriate places throughout this technical manual.

www **Overview of all GigE accessories:**

Allied Vision provides accessories to run and connect the Goldeye. To obtain an overview of all accessories available, go to the Allied Vision Accessories web page:

http://www.alliedvision.com/en/products/accessories.html

Ethernet adapters

The Ethernet adapters listed below are available for purchase from Allied Vision.

Model/Description	Allied Vision order no.
Standard adapter Intel CT, PCIe x1, 1 port	02-3003B
Dual port adapter w/o PoE Intel Pro1000/PT, PCIe x4, 2 port	02-3005A
Dual port PoE adapter Adlink GIE62+ PCIe x4, 2 port	2685
Four port PoE adapter Adlink GIE64+ PCIe x4, 4 port	2686

Power adaptors

Model/Description Use only for **Goldeye G-032** and **G-033** cameras.	Allied Vision order no.
North American supply, 12 V / 1.25 A: Desktop power supply 12-pin Hirose female plug / US plug	02-8003D
European supply: Desktop power supply 12-pin Hirose female plug, EURO plug	02-8004D
Power supply, 12 V DC, 15 W, standard Hirose 12p receptacle straight push-pull	E3100002

Model/Description Use only for **Goldeye G-032 Cool** cameras.	Allied Vision order no.
North American and European supply, 12 V / 5 A: Desktop power supply 4-pin Hirose female plug	1021080

Hirose 12-pin I/O connectors

With **Goldeye G-032** and **G-033** cameras, use these connectors or cables for signal input/output and for power supply.

With **Goldeye G-032 Cool** cameras, use these connectors or cables for signal input/output only.

Model/Description	Allied Vision order no.
Hirose 12-pin connector w/o cable	K7600040
I/O cable w/ Hirose 12-pin connector, 2 m	2814
I/O cable w/ Hirose 12-pin connector, 3 m	2815
I/O cable w/ Hirose 12-pin connector, 5 m	2817
I/O cable w/ Hirose 12-pin connector, 10 m	2818
Trigger cable In1 BNC LVTTL w/ Hirose 12-pin connector, 2 m	1068908
Trigger cable In1 BNC LVTTL w/ Hirose 12-pin connector, 5 m	1068909

Hirose 4-pin power connectors

Use only for power supply of **Goldeye G-032 Cool** cameras :

Model/Description	Allied Vision order no.
Hirose 4-pin connector w/o cable	02-7001A
Power cable w/ Hirose 4-pin connector, 2 m	1068904
Power cable w/ Hirose 4-pin connector, 3 m	1068905
Power cable w/ Hirose 4-pin connector, 5 m	1068906
Power cable w/ Hirose 4-pin connector, 10 m	1068907

Legislation

This chapter includes:

- Information about the legal requirements and restrictions for all Allied Vision cameras based on current and relevant legislation
- Particular emphasis has been given to legislation of the European Economic Area (CE, RoHS, WEEE) as well as legislation of the United States of America (FCC)

Notice **Please read this manual carefully.**

Inaccurate data or damage to the equipment caused by disregard of this manual are not subject to warranty.

Before using the camera, please ensure you read the relevant information on the Allied Vision Knowledge Base web page: http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.
Also, ensure that you have installed the hardware and software on your PC or laptop (GigE interface card, cables etc.).

European Economic Area (EEA) requirements

CE conformity

Allied Vision declares under its sole responsibility that all cameras of the Goldeye family are in conformity with the following standard(s) or other normative document(s):

- CE
- RoHS (2011/65/EU)

WEEE compliance

This product must be disposed of in compliance with the directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

FCC - Class B Device

Legal notice

For customers in the U.S.A.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interferences not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Use a different line outlet for the receiver.
- Consult a radio or TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. The shielded interface cable referenced in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart B of Part 15 of FCC Rules.

For customers in Canada

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

Pour utilisateurs au Canada

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

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Allied Vision customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Allied Vision for any damages resulting from such improper use or sale.

Other legal notices

Warning **Observe safety when using electrical connections.**

For connections to any power outlet, only use suitable connectors, and/or adapters with a grounding lead.

Use sufficient grounding to minimize the risk of damage.

Caution **Burns to the skin possible if camera housing is hot**

The camera housing may heat up during operation. Touching the camera with bare hands may lead to injuries.

Wear protective gloves when touching a heated-up camera during operation.

Also, use proper heat dissipation methods to keep the camera as cool as possible.

Notice **Read the safety instructions online:**

Before operating any Allied Vision camera, read the safety instructions and ESD warnings in the Allied Vision GigE Installation Manual. You find it in the Allied Vision Knowledge Base web page: http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Appliance classification

The camera family described in this manual is intended for commercial use only, for shortwave infrared light, without audio recording, without internal storage facility.

Target group

This technical manual is a guide to detailed technical information and handling instructions; therefore, it is intended **for trained machine vision specialists only**.

Intended use

- The Goldeye camera family is designated for commercial use only.
- The Goldeye camera family is no protective gear or can be used as such.
- Liability covers only the camera and the software created by Allied Vision. This manual includes references to software and accessories that have been tested by Allied Vision and fulfill Allied Vision's high quality requirements. However, Allied Vision is not liable for any damage caused by third-party software and/or third-party accessories.
- Liability can be granted only if the user adheres to the handling instructions and safety advices in the Allied Vision camera documentation literature.
- For any questions concerning camera operation that are not covered by this technical manual, contact Allied Vision support or your Allied Vision distributor.
- For all repair or maintenance work, please contact your Allied Vision distributor.
- Prior to opening the camera, written consent of the manufacturer must be obtained. Tampering with the camera terminates the warranty immediately.

Trademarks

Unless stated otherwise, all trademarks appearing in this document of Allied Vision are brands protected by law.

Warranty

The information provided by Allied Vision is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also, excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-violation of laws and patents. Even if we assume that the information supplied to us is accurate, errors and inaccuracy may still occur.

Copyright

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Allied Vision Technologies GmbH 03/2015

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Introduction

This chapter includes

- Overview of the manual (short description of each chapter), the document history, and conventions used in this manual (styles and symbols)
- References to further information about Allied Vision GigE cameras, available Allied Vision software (incl. documentation), and where to obtain it

This **Goldeye Technical Manual** describes in depth the technical specifications and operating principle of the Goldeye camera family (Allied Vision order no. 4068xxx), including feature overview, dimensions, I/O definition, pixel formats, image processing and IR-specific data processing, basic and advanced parameters, and settings as well as bandwidth and frame rate related subjects.

Document history

Version	Date	Description
V 1.0.0	2014-Jul-11	First release of the document.
V 1.1.0	2014-Oct-24	Added descriptions concerning automatic non-uniformity correction. Introduced the new Chapter Resolution and ROI. Added description of Goldeye G-032 SWIR Cool in multiple chapters. Added small updates to Chapter Legislation.
V 1.2.0	2014-Nov-07	Updated to new brand name and new brand logo
V 1.3.0	2015-Mar-20	Introduction of Goldeye G-033. Extended the description of image corrections.

Table 1: Document history

Manual overview

This **manual overview** outlines the contents of each chapter of this manual.

- chapter Customer assistance on page 7:

  Allied Vision contact data for
  - Technical information/ordering
  - Technical support
  - Commercial information
- chapter Legislation on page 12:

  Information about the legal requirements and restrictions concerning all Allied Vision cameras, based on current and relevant legislation. Particular emphasis has been given to legislation of the European Economic Area (CE, RoHS, WEEE) as well as legislation of the Americas (FCC).
- chapter Introduction on page 18 (this chapter):

  Overview of the manual (short description of each chapter), the document history, and conventions used in this manual (styles and symbols). Additionally, there are references to further information about Allied Vision

GigE cameras, available Allied Vision software (incl. documentation) and where to obtain it.

- chapter Technical Data on page 22:

  Technical specifications, advanced features, and measured spectral sensitivity diagrams for each Goldeye camera type.

  Information about sensor position accuracy of Goldeye SWIR cameras.

  Frame rates that result when changing the resolution from smallest to maximum window size, lists frame rates achievable with common video formats, and explains how frame rates are calculated.
- chapter Dimensions on page 35:

  CAD drawings and dimensions of standard housing models including available lens mounts.
- chapter Filters and Mounts on page 43:

  Lens mounts available for the Goldeye family, available filter options and how to change filters, and the lenses that can be used with the Goldeye camera.
- chapter Camera interfaces on page 54:

  General description of power supply and all inputs and outputs of the cameras (incl. trigger features)—Gigabit Ethernet port, I/O connector pin assignments, schematic input/output block diagrams as well as a general description of trigger rules such as timing diagram and definitions.
- chapter Data processing path on page 75:

  Description of the data path of the Goldeye cameras in block diagrams, explanation of the IR-specific image processing features of the Goldeye firmware, and a listing of all camera control features of the Goldeye.
- chapter Temperature control on page 97:

  Principle and functionalities of temperature management and cooling of the Goldeye G.
- chapter Appendix on page 106:
  - Information about the firmware update of GigE cameras.
  - Instructions on camera cleaning.
- chapter Index on page 115:

  Quick access to all relevant data in this manual.

Conventions used in this manual

To give this manual an easily understood layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style	Function	Example
Bold	Programs, inputs or highlighting important things	**bold**
Monospaced	Code listings, camera output etc.	`Input`
Upper case	Register	REGISTER
Italics	Modes, fields	*Mode*
Parentheses and/or blue	Links	(Link)

Table 2: Styles used in this manual

Symbols and notes

Notice **Possible material damage**

This symbol is used to address important information to avoid material damage; however, is not related to physical injury.

Advice **Safety-related instructions to avoid malfunctions**

This symbol indicates important or specific instructions or procedures that are related to product safety. You have to follow these instructions to avoid malfunctions.

Tip **Practical tip**

This symbol highlights a practical tip that helps to better understand the camera's features and functions, and to make better use of it.

www **Further information available online**

This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:

http://www.alliedvision.com

Technical Data

This chapter provides:

- Technical specifications, advanced features, and measured spectral sensitivity diagrams for each Goldeye G camera type
- Information about sensor position accuracy of Goldeye SWIR cameras
- Frame rates that result when changing the resolution from smallest to maximum window size, lists frame rates achievable with common video formats, and explains how frame rates are calculated

Models and modular options

Tip

Goldeye camera family

The following camera models and modular options are available.

Model Type	Allied Vision order no.
Goldeye G-032 SWIR w/ C-Mount adapter	4068000
Goldeye G-032 SWIR w/ F-Mount adapter	4068001
Goldeye G-032 SWIR w/ M42-Mount adapter	4068003
Goldeye G-032 SWIR Cool w/ C-Mount adapter	4068520
Goldeye G-032 SWIR Cool w/ F-Mount adapter	4068521
Goldeye G-032 SWIR Cool w/ M42-Mount adapter	4068523
Goldeye G-033 SWIR w/ C-Mount adapter	4068030
Goldeye G-033 SWIR w/ F-Mount adapter	4068031
Goldeye G-033 SWIR w/ M42-Mount adapter	4068033

Advanced features

Allied Vision Goldeye cameras support a number of standard and extended features. The list below lists a selection of prominent capabilities of the Goldeye camera family.

www

Listing of camera controls available online:

A complete listing of camera controls, including control definitions, can be downloaded from the Allied Vision Knowledge web page:
http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

- GigE Vision compliant interface including support for Power-over-Ethernet (PoE/PoE+)
- GenICam compliant feature control, feature naming in accordance with the SFNC (Standard Feature Naming Convention)
- Support of various cutting-edge InGaAs sensors (FPAs) from a variety of manufacturers
- Multi-channel readout to enable maximum sensor frame rates

- Temperature-stabilized thermoelectric cooling (TEC) of the FPA to ensure consistently good image quality
- Compact and lightweight housing
- Rugged industrial design for machine vision applications (flexible mounting options, lockable connectors, etc.)
- Comprehensive I/O control options for external triggering, lighting and device control
- Extended feature set, e.g.:
  - Built-in image correction data sets for non-uniformity correction and defect pixel correction.
  - ROI control including frame rate increase
  - Various auto feature control options
  - Firmware upload via data-interface (GigE port)

Support for Allied Vision software solutions: *VIMBA SDK*, *Acquire Control*, etc.

Camera Specifications

Goldeye G-032 SWIR, Goldeye G-032 SWIR Cool

Data sheet

Parameter	G-032	G-032 Cool
Sensor		
Sensor	InGaAs, progressive scan, electronic full frame shutter	InGaAs, progressive scan, electronic full frame shutter
Sensor type	Focal plane array (FPA)	Focal plane array (FPA)
Spectral range	900 nm – 1700 nm	900 nm – 1700 nm
Resolution	636 (H) x 508 (V)	636 (H) x 508 (V)
Cell size	25 µm x 25 µm	25 µm x 25 µm
Effective chip size	15.9 mm x 12.7 mm	15.9 mm x 12.7 mm
Dark current	380 ke^-/s (@ +20 °C FPA temperature)	30 ke^-/s (@ -20 °C FPA temperature)
Readout noise (Gain0)	400 e^-	400 e^-
Readout noise (Gain1)	170 e^-	170 e^-
Saturation capacity (Gain0)	1.9 Me^-	1.9 Me^-
Saturation capacity (Gain1)	39 ke^-	39 ke^-
Dynamic range (Gain0)	73 dB	73 dB

Table 3: Specifications Goldeye G-032 SWIR and Goldeye G-032 SWIR Cool

Parameter	G-032	G-032 Cool
Dynamic range (Gain1)	47 dB	47 dB
Pixel operability	>99.5 %	>99.5 %
Exposure time *	6 µs to 200 ms	6 µs to 1250 ms
Max. frame rate at full resolution	100 fps	100 fps
Cooling	Single-stage thermoelectric cooling (TEC1)	Dual-stage thermoelectric cooling (TEC2)
Analog gain levels	Gain0, Gain1	Gain0, Gain1
A/D converter	14 bit	14 bit
On-board FIFO	256 MiB, 409 frames at full resolution	256 MiB, 409 frames at full resolution
Output		
Digital interface	GigE Vision (based on IEEE 802.3 1000BASE-T)	GigE Vision (based on IEEE 802.3 1000BASE-T)
Bit depth	8 - 14 bit	8 - 14 bit
Pixel formats	Mono8, Mono12, Mono12Packed, Mono14	Mono8, Mono12, Mono12Packed, Mono14
General purpose inputs/outputs		
Opto-coupled I/Os	1 input, 2 outputs	1 input, 2 outputs
RS-232	115 200 Baud, 8N1 (adjustable)	115 200 Baud, 8N1 (adjustable)
LVTTL I/Os	1 input, 1 output	1 input, 1 output
Mechanics		
Body dimensions (L x W x H) w/o lens adapter	78 mm x 55 mm x 55 mm	90 mm x 80 mm x 80 mm
Lens mount	C-Mount /F-Mount /M42-Mount available	C-Mount /F-Mount /M42-Mount available
Mass, body only, w/o adapter	350 g	790 g
Mass, w/ C-Mount adapter	370 g	810 g
Mass, w/ F-Mount adapter	420 g	860 g
Mass, w/ M42-Mount adapter	390 g	830 g
Operating conditions		
Case temperature	-20 °C to +55 °C	-20 °C to +55 °C
Storage temperature	-20 °C to +70 °C	-20 °C to +70 °C
Sensor cooling temperature, setpoints	+5 °C, +20 °C, +35 °C, +50 °C, or user-configurable	-20 °C, -5 °C, +10 °C, or user-configurable
Temperature monitoring	Available for both camera and sensor	Available for both camera and sensor

Table 3: Specifications Goldeye G-032 SWIR and Goldeye G-032 SWIR Cool (continued)

Parameter	G-032	G-032 Cool
Relative humidity	10 % to 95 %, non-condensing	10 % to 95 %, non-condensing
Power requirements (DC)	10.8 V to 30.0 V or via PoE	10.8 V to 30.0 V or via PoE+
Max. power consumption	<12.95 W (@ PoE), 10.8 W (@ 12 V DC)	22 W (@ PoE+), 19 W (@ 12 V DC)
Typical power consumption without cooling	6.5 W (@ PoE), 5 W (@ 12 V DC)	8 W (@ PoE+), 6 W (@ 12 V DC)
Regulations	CE, FCC part 15 class B	CE, FCC part 15 class B
Mechanical tests	Random vibration (IEC 60068-2-64) Shock (IEC 60068-2-27)	Random vibration (IEC 60068-2-64) Shock (IEC 60068-2-27)
Notes:		
* The maximum exposure values specified are for Gain0 and sensor temperature of +20°C (for G-032) or -20°C (for G-032 Cool). Even longer exposures can be set, but the image quality may deteriorate.		

Table 3: Specifications Goldeye G-032 SWIR and Goldeye G-032 SWIR Cool (continued)

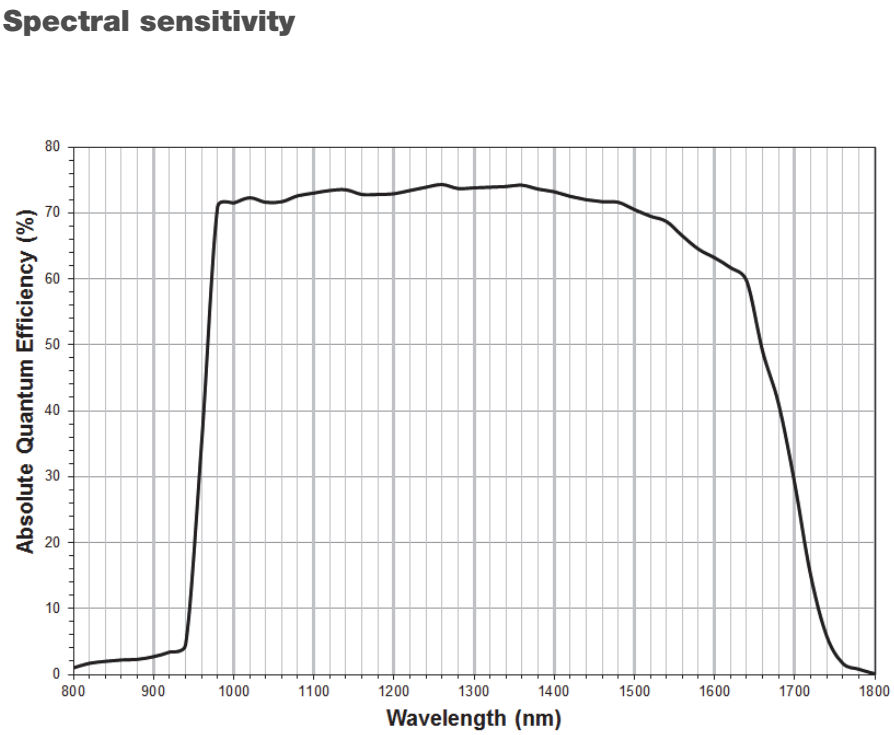


Figure 1: Spectral sensitivity Goldeye G-032 SWIR and Goldeye G-032 SWIR Cool

Goldeye G-033 SWIR

Data sheet

Parameter	G-033
Sensor	
Sensor	InGaAs, progressive scan, electronic full frame shutter
Sensor type	Focal plane array (FPA)
Spectral range	900 nm – 1700 nm
Resolution	640 (H) x 512 (V)
Cell size	15 µm x 15 µm
Effective chip size	9.6 mm x 7.68 mm
Dark current	110 ke^-/s (@ +20 °C FPA temperature)
Readout noise (Gain0)	390 e^-
Readout noise (Gain2)	32 e^-
Saturation capacity (Gain0)	1.2 Me^-
Saturation capacity (Gain2)	25 ke^-
Dynamic range (Gain0)	69 dB
Dynamic range (Gain2)	59 dB
Pixel operability	>99.5 %
Max. frame rate at full resolution	301 fps (in 8-bit mode)
Exposure time *	1 µs to 200 ms
Cooling	Single-stage thermoelectric cooling (TEC1)
Analog gain levels	Gain0, Gain1, Gain2
A/D converter	14 bit
On-board FIFO	256 MiB, 409 frames at full resolution
Output	
Digital interface	GigE Vision (based on IEEE 802.3 1000BASE-T)
Bit depth	8 - 14 bit
Pixel formats	Mono8, Mono12, Mono12Packed, Mono14
General purpose inputs/outputs	
Opto-coupled I/Os	1 input, 2 outputs

Table 4: Specifications Goldeye G-033 SWIR

Parameter	G-033
RS-232	115 200 Baud, 8N1 (adjustable)
LVTTL I/Os	1 input, 1 output
Mechanics	
Body dimensions (L x W x H) w/o lens adapter	78 mm x 55 mm x 55 mm
Lens mount	C-Mount /F-Mount /M42-Mount available
Mass, body only, w/o adapter	350 g
Mass, w/ C-Mount adapter	360 g
Mass, w/ F-Mount adapter	410 g
Mass, w/ M42-Mount adapter	390 g
Operating conditions	
Case temperature	-20 °C to +55 °C
Storage temperature	-20 °C to +70 °C
Sensor cooling temperature, setpoints	+5 °C, +10 °C +35 °C, +50 °C, or user-configurable
Temperature monitoring	Available for both camera and sensor
Relative humidity	10 % to 95 %, non-condensing
Power requirements (DC)	10.8 V to 30.0 V or via PoE
Max. power consumption	<12.95 W (@ PoE), 10.8 W (@ 12 V DC)
Typical power consumption without cooling	8 W (@ PoE), 6.3W (@ 12 V DC)
Regulations	CE, FCC part 15 class B
Mechanical tests	Random vibration (IEC 60068-2-64) Shock (IEC 60068-2-27)
Notes:	
* With an external trigger through the LVTTL input, the shortest exposure time is 330 ns. The maximum exposure value is for Gain0 and sensor temperature of +20°C. Even longer exposures can be set, but the image quality may deteriorate.	

Table 4: Specifications Goldeye G-033 SWIR (continued)

Spectral sensitivity

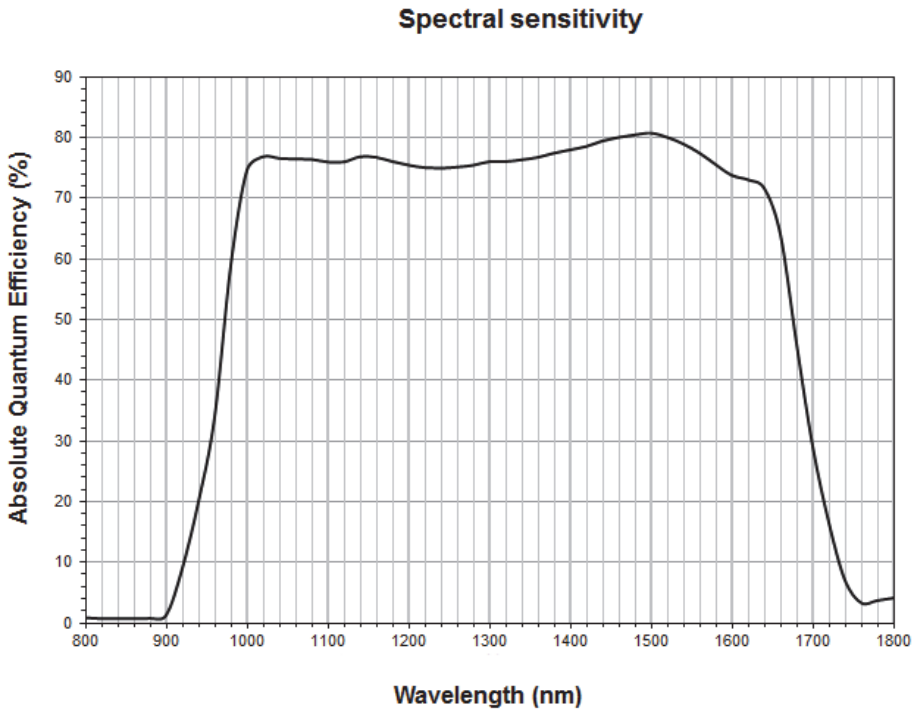


Figure 2: Spectral sensitivity Goldeye G-033 SWIR

Resolution and ROI frame rates

The maximum frame rate achievable with each Goldeye G Camera is influenced by a number of factors, predominantly the ROI settings.

To achieve the maximum possible frame rate at any ROI size, it might be necessary to adjust the GigE packet size:

- Smaller packets may be advantageous if using small ROIs
- Larger packets may be advantageous if using larger ROIs

Goldeye G-032 SWIR, Goldeye G-032 SWIR Cool

Possible frame rates in frames/second (fps) can be calculated with the formula below.

- The minimum ROI width is 8 pixels.
- The minimum ROI height is 4 pixels.

$$\mathrm{FrameRate} = \frac{10,000,000}{[(V+4)\times(H/4+32)]+129}$$

H	ROI: horizontal resolution (width), the formula is valid if H ≥ 128, H must be rounded up to the next multiple of 16.
V	ROI: vertical resolution (height), the formula is valid if V ≥ 8, V must be rounded up to the next multiple of 4.

Examples for frame rates possible with the Goldeye G-032, using a number of common resolutions, are listed in Table 5: Image resolutions/formats and resulting maximum frame rates lists.

Resolution		Format name	Frame rate max. [fps]
Horizontal	Vertical		
636	508	Sensor full format	100
636	480	Approx. matches VGA format	107
320	240	Matches QVGA format	364

Table 5: Image resolutions/formats and resulting maximum frame rates

Resolution		Format name	Frame rate max. [fps]
Horizontal	Vertical		
160	120	Matches 1/4 QVGA format	1103
≤ 128	≤ 8	In all resolutions smaller than this the frame rate stays the same.	11123

Table 5: Image resolutions/formats and resulting maximum frame rates

Goldeye G-033 SWIR

The maximum frame rate achievable with the Goldeye G and Goldeye G Cool is influenced by a number of factors, predominantly the ROI settings.

- The minimum ROI width is 8 pixels.
- The minimum ROI height is 4 pixels.

Possible frame rates in frames/second (fps) can be calculated with the formula below.

$$\mathrm{FrameRate} = \frac{18,000,000}{[(V+1)\times(H/8+36)]+265}$$

H — ROI: horizontal resolution (width),
the formula is valid if H ≥ 32, H must be rounded up to the next multiple of 32.

V — ROI: vertical resolution (height),
the formula is valid if V ≥ 4, V must be rounded up to the next multiple of 4.

Examples for frame rates possible with the Goldeye G-033, using a number of common resolutions, are listed in Table 6: Image resolutions/formats and max. frame rates.

Note that computational limitations of the host and image capture software may prevent the camera from achieving maximum frame rates.

To achieve the highest possible frame rates for different formats, it may become necessary to change the GigE streaming features, particularly the packet size.

Resolution		Format name	Frame rate max. [fps]
Horizontal	Vertical		
640	512	Sensor full format	301 (8-bit mode)
640	480	Matches VGA format	310 (8-bit mode)
320	240	Matches QVGA format	968 (8-bit mode)
160	120	Matches 1/4 QVGA format	2556
≤ 128	≤ 24		>11500

Table 6: Image resolutions/formats and max. frame rates

Sensor position accuracy

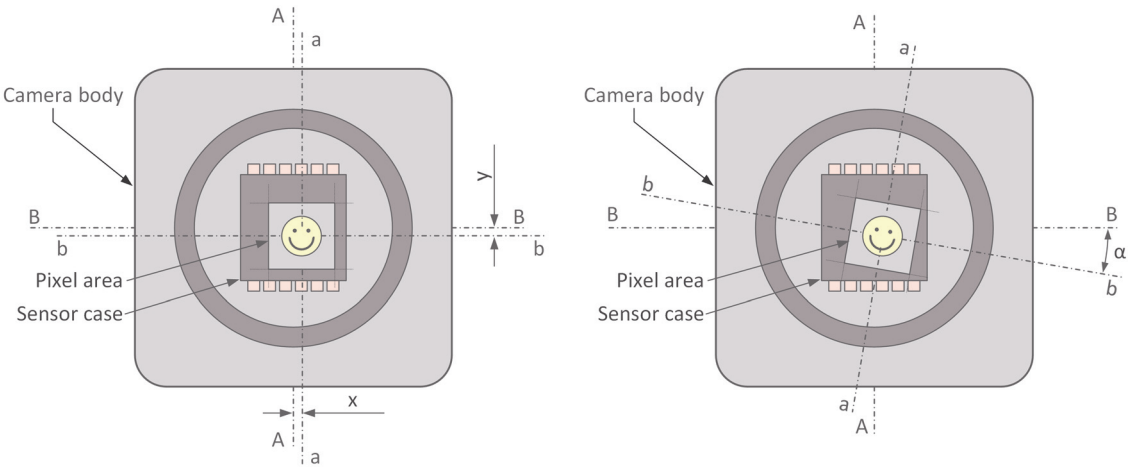


Figure 3: Sensor position accuracy

Method of positioning

Optical alignment of the photo sensitive sensor area into the camera front module (lens mount front flange).

Reference points

Sensor: center of the pixel area (photo sensitive cells) = intersection of the lines **a** and **b**.

Camera: Center of the camera front flange (outer case edges) = intersection of lines **A** and **B**.

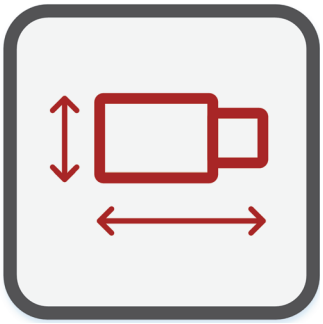
Accuracy

The accuracy requirements outlined in the table below must be observed for all positioning tasks.

Sensor shift	x / y	± 150 µm
Optical back focal length	z	+ 0 µm to - 150 µm
Sensor rotation	α	± 0.5 °

Tip **X/Y - tolerances**

x/y - tolerances between the C-Mount hole and the pixel area may be higher.



Dimensions

This chapter includes:

- CAD drawings and dimensions of standard housing models including available lens mounts

Mounting the camera

You can affix the camera to a base in two ways:

1. To affix the camera to any horizontal or vertical base, four mounting threads M4 x 6mm are located on each side of the camera, except for the back side.

   Observe the following:
   - Refer to the drawings below for the exact distances between the mounting threads.
   - To avoid damaging the camera housing, we recommend to use bolts with an effective length of 4 to 6 mm and apply a maximum torque of 2.0 Nm to each bolt.

2. To affix the camera to the common mounting plate of tripods used in photography, a 1/4 - 20 UNC thread hole is located on the camera bottom.

Caution **Ensure the camera does not disengage from base.**

The camera can disengage from its base and fall down if it is not properly affixed.

Affix the camera either with four metal bolts with an effective length of not less than 4 mm and apply a torque of 2.0 Nm to each bolt, or use the UNC thread and a mechanical safe guard.

Camera dimensions

Goldeye G-032 SWIR C-Mount, Goldeye G-033 SWIR C-Mount

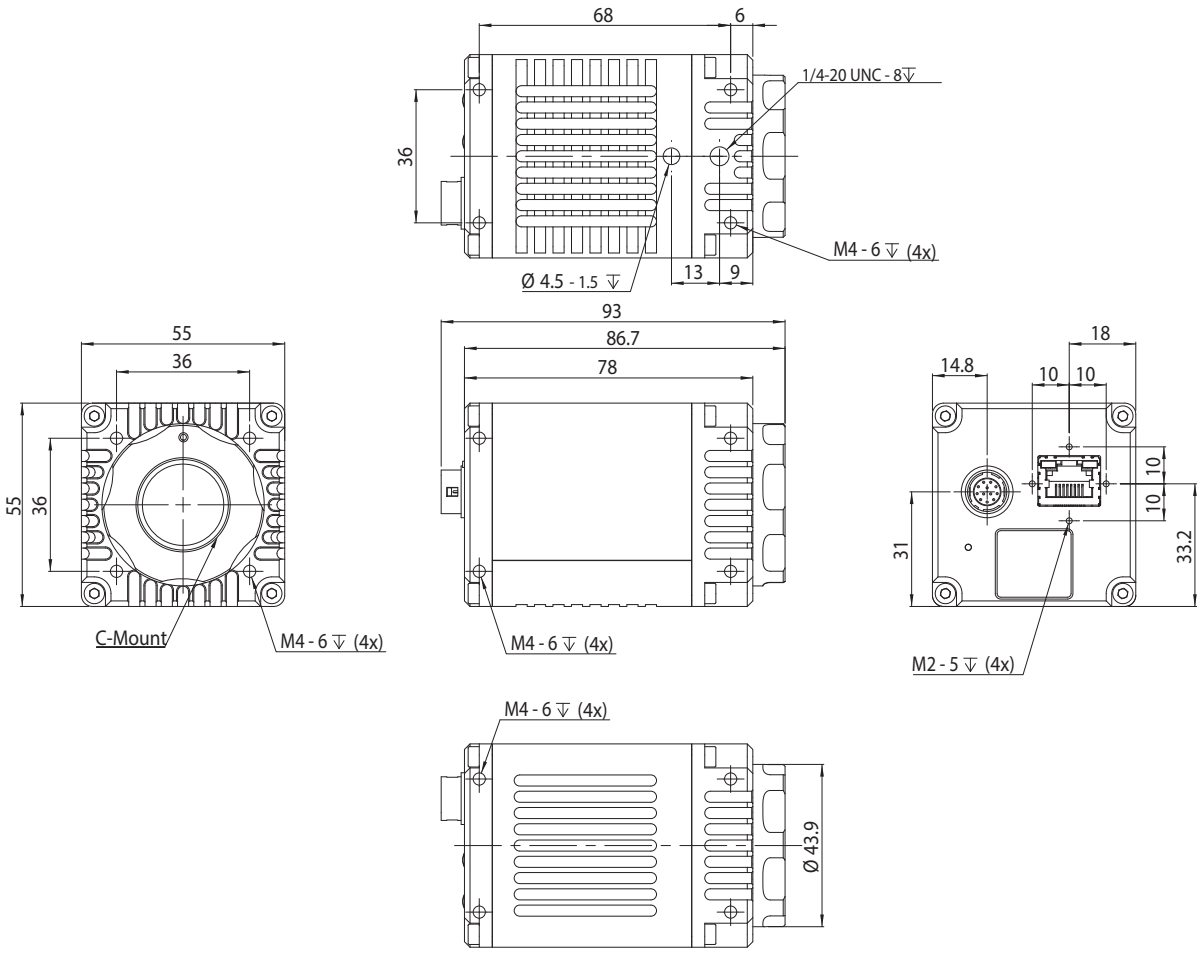


Figure 4: Dimensions Goldeye G-032 SWIR with C-Mount lens adapter

Camera dimensions

Goldeye G-032 SWIR F-Mount,
Goldeye G-033 SWIR F-Mount

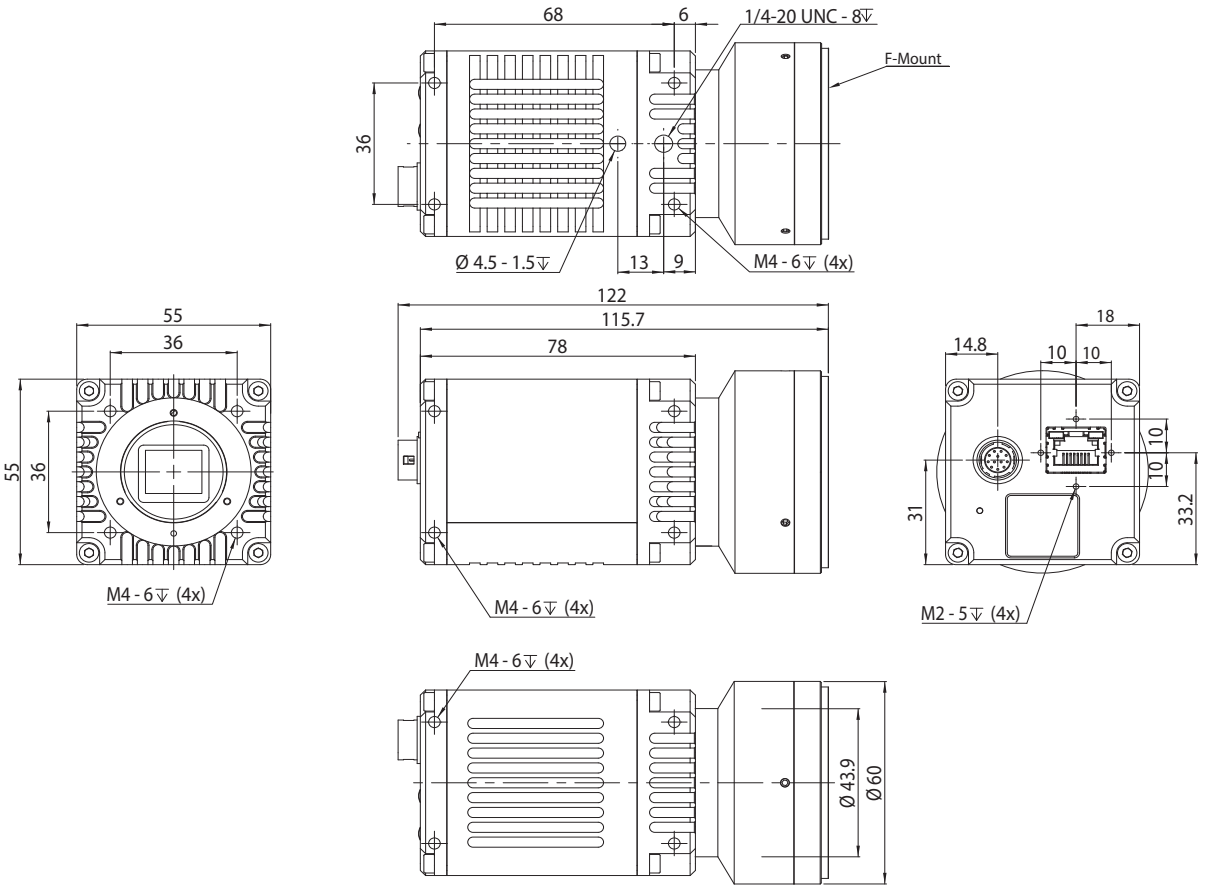


Figure 5: Dimensions Goldeye G-032 SWIR with F-Mount lens adapter

Camera dimensions

Goldeye G-032 SWIR M42-Mount
Goldeye G-033 SWIR M42-Mount

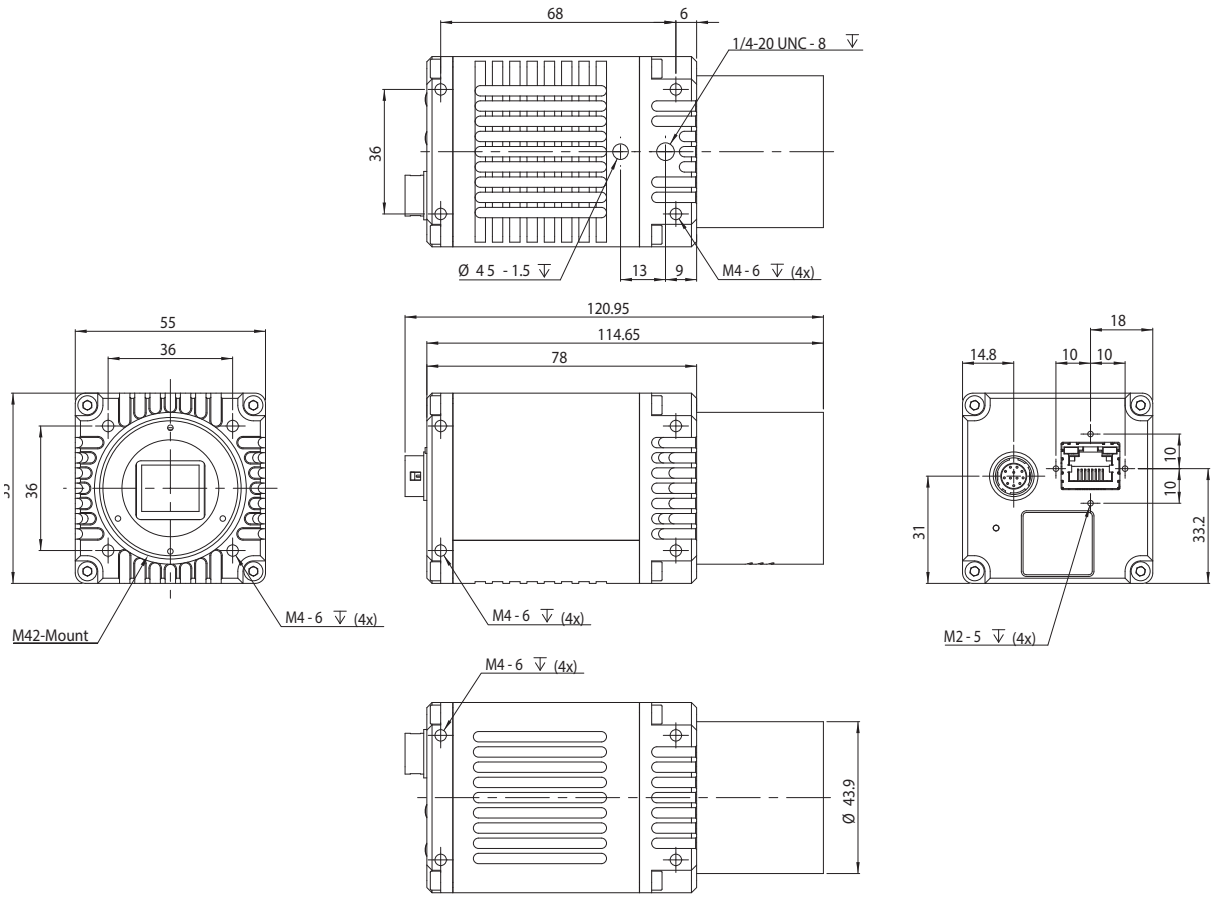


Figure 6: Dimensions Goldeye G-032 SWIR with M42-Mount lens adapter

Camera dimensions

Goldeye G-032 SWIR Cool C-Mount

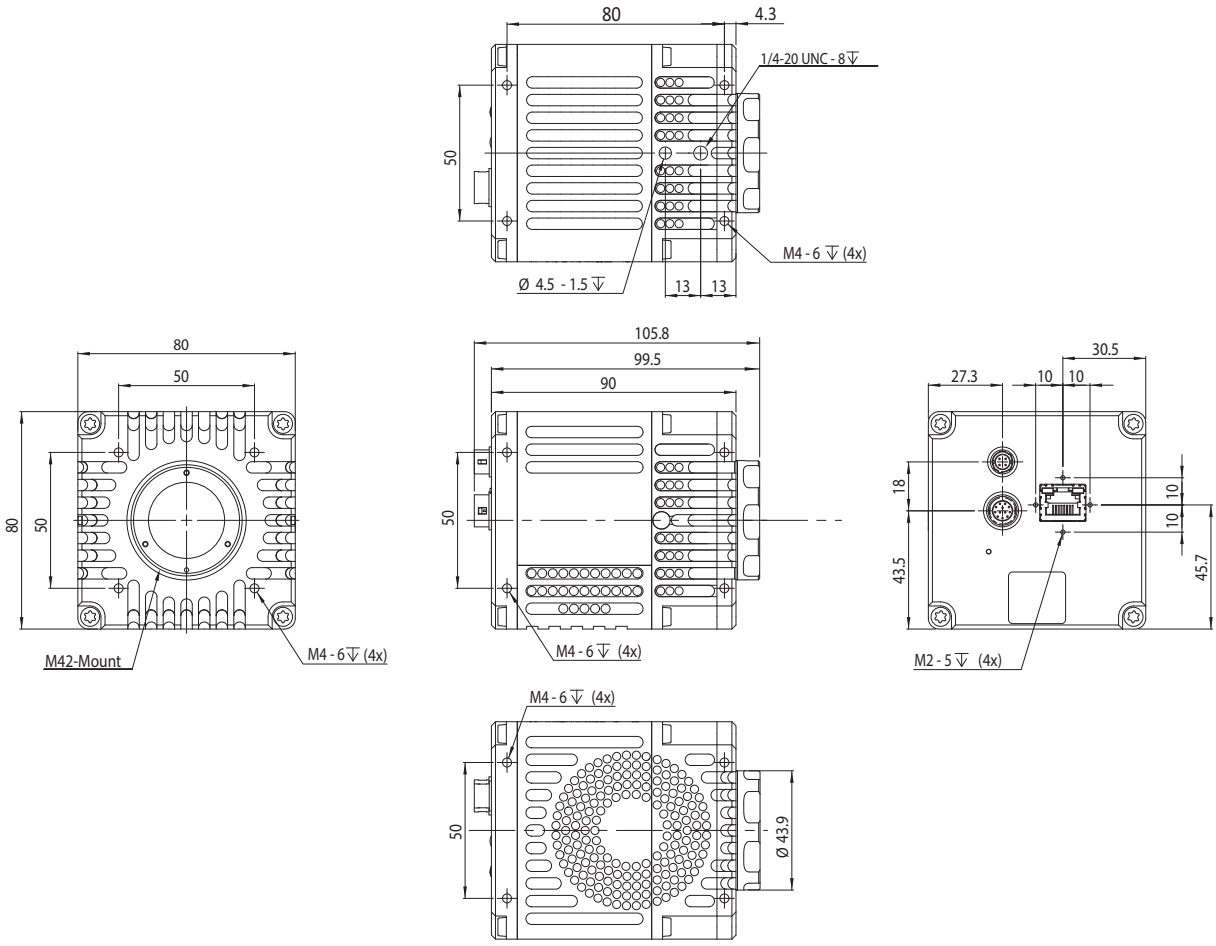


Figure 7: Dimensions Goldeye G-032 Cool with C-Mount lens adapter

Camera dimensions

Goldeye G-032 SWIR Cool F-Mount

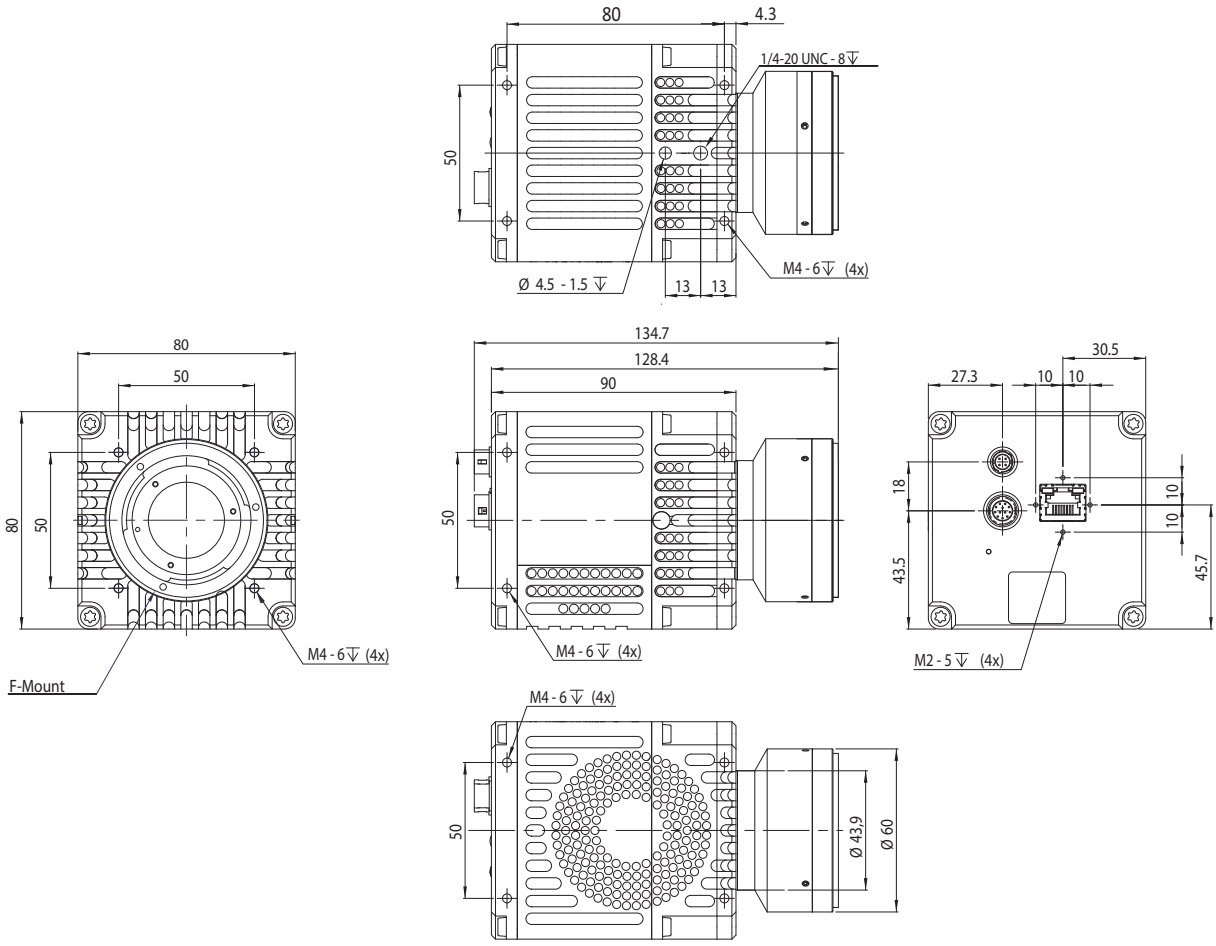


Figure 8: Dimensions Goldeye G-032 with F-Mount lens adapter

Camera dimensions

Goldeye G-032 SWIR Cool M42-Mount

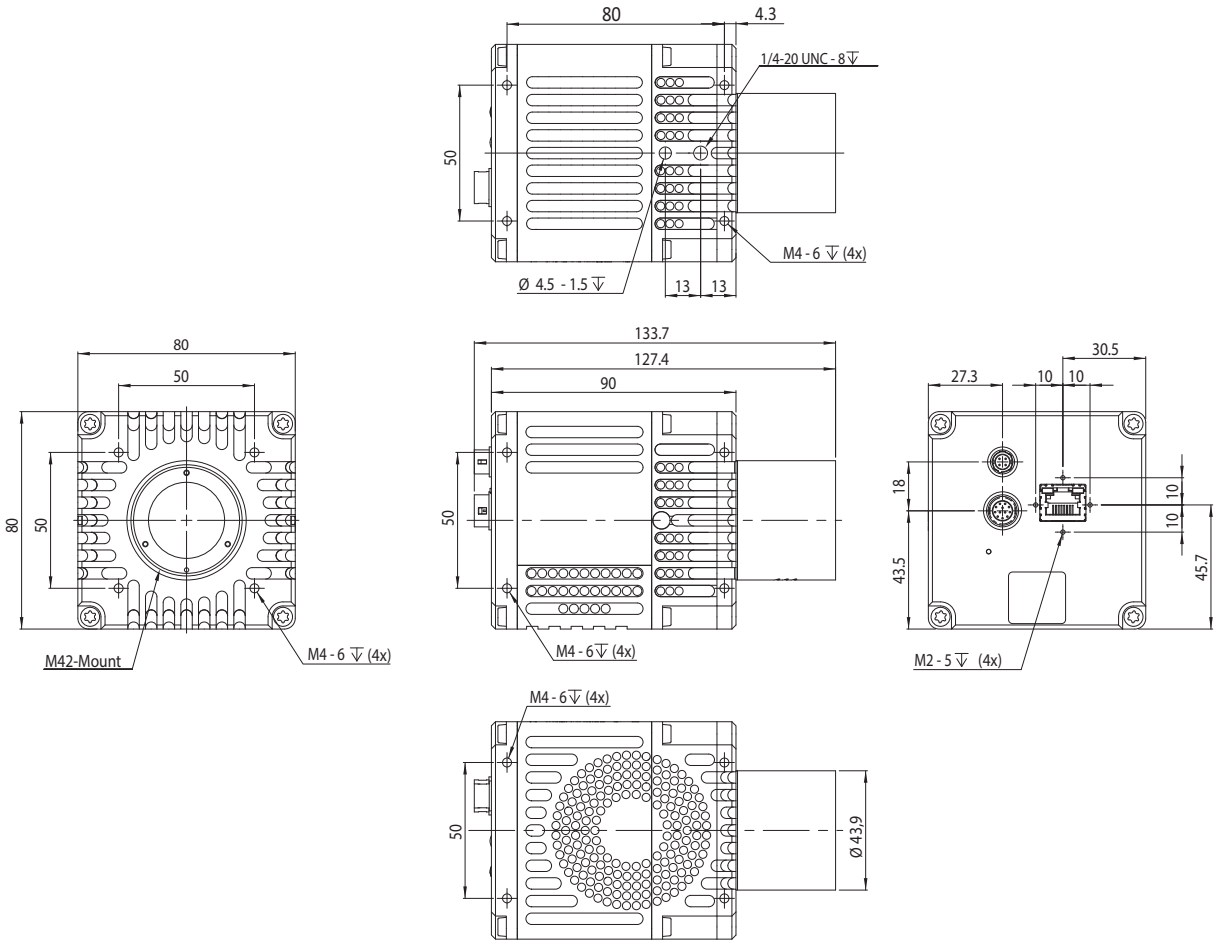
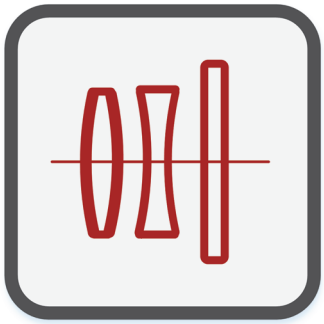


Figure 9: Dimensions Goldeye G-032 with M42-Mount lens adapter



Filters and Mounts

This chapter includes:

- Information about the lens mounts available for the Goldeye G camera family
- Available filter options and how to change filters

The Goldeye is available with lens adapters for C-Mount, F-Mount, and M42-Mount to support lenses of different makes and models.

Each lens adapter has a recess to accommodate suitable filters.

Changing the lens adapter

The lens adapter is screwed onto the M42 thread of the camera body. To exchange it with a different adapter, unscrew it and screw on the other adapter.

For consistent image quality, we recommend to use only Allied Vision lens adapters.

Notice **Take special care when removing filter or protection glass.**

- Removing the filter from the camera requires special care.
- Ask your distributor for assistance if you are not confident with the procedure.
- To avoid contamination, never touch optical surfaces with bare hands.

Notice **Remove mount adapters carefully**

- All mount adapters of Goldeye G cameras are secured with locking screws. To avoid damage to the camera, these locking screws need to be untightened before removing or changing the mount adapter.

  See Figure 10 below for the position of the locking screws.
- To avoid damage to the thread, never use any tools to screw the mount adapter on or off.

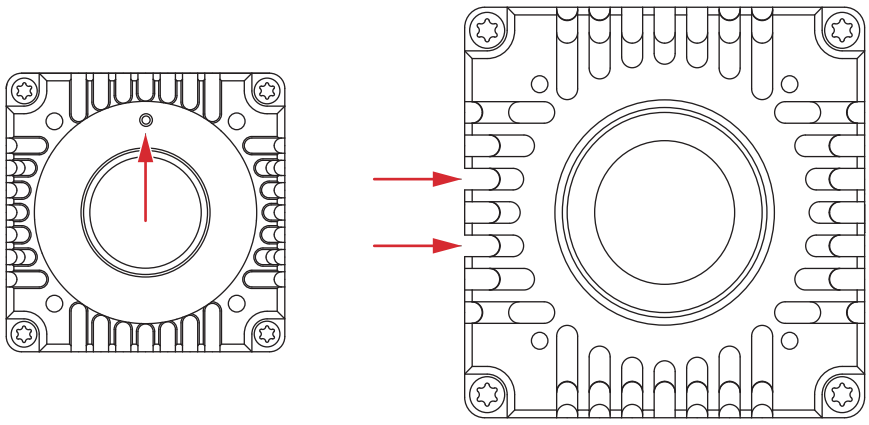


Figure 10: Position of safety screws on mount adapters:
use a 0.9 mm hex key for all mounts of Goldeye G-032 and G-033 (left),
use a 1.3 mm hex key for all mounts of Goldeye G-032 Cool (right).

C-Mount

Tip

C-Mount lens adapter

A separate lens adapter for C-Mount lenses is available for purchase from Allied Vision. This adapter fits into the M42-Mount of the camera front flange.

For readily assembled mount adapters with special-purpose filter glass see section Specific filter applications on page 52.

Model/Description	Allied Vision order no.
M42/C-Mount Adapter without filter glass	1068100

Specifications of the C-Mount adapter

Suitable filter glass, diameter:	25.0 mm - 25.5 mm
Suitable filter glass, thickness:	up to 2.5 mm
Maximum protrusion w/ filter:	6.6 mm

Table 7: Specifications of the C-Mount adapter

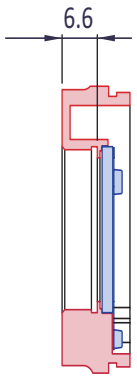


Figure 11: Cross section of the C-Mount adapter (red) with filter (blue) and max. protrusion

Changing the filter in the C-Mount adapter

If the C-Mount adapter has a filter glass fitted, it is possible to change the filter glass. (See section Specific filter applications on page 52 for more details on mount adapters with pre-fitted filters.)

To change the filter of the C-Mount lens adapter, follow the instructions below.

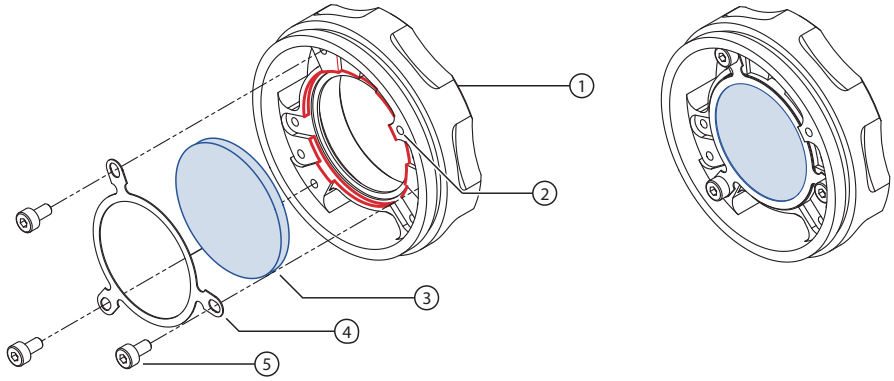


Figure 12: Changing the filter in the C-Mount adapter

1. Remove the lens that might be screwed into the C-Mount adapter.
2. Unscrew the adapter (1) from the camera.
   - Loosen the locking screw (2, shown from back of adapter) on the outside of the mount adapter. See Figure 10 on page 44 for the position of the locking screws.
     Use a 0.9 mm hex key Goldeye G-032 and G-033,
     use a 1.3 mm hex key Goldeye G-032 Cool.
   - To avoid penetration of foreign substances into the camera, ensure that the front flange is covered with a dust cap. See *section Avoiding the necessity of camera cleaning on page 109*.
3. On the back side of the mount, loosen the three cylinder bolts (5) of the filter fixing ring (4), using a Torx T6 tool.
4. Remove the fixing ring.
5. Remove the existing filter glass (3) from the adapter.
6. Insert the new filter glass into the matching recess.
   - See Figure 12 (blue = filter, red = filter recess).
   - See Table 7 above for dimensions of suitable filter glasses.
7. Reinsert the fixing ring into the adapter.
8. Fix the ring with the three cylinder bolts.
   - Tighten the bolts with a max. torque of 0.25 Nm.
9. Screw the adapter into the camera again.

10. Tighten the locking screw with a max. torque of 0.25 Nm.

F-Mount

Tip

F-Mount lens adapter

A separate lens adapter for F-Mount lenses is available for purchase from Allied Vision. This adapter fits into the M42-Mount of the camera front flange.

For readily assembled mount adapters with special-purpose filter glass see section Specific filter applications on page 52.

Model/Description	Allied Vision order no.
M42/F-Mount Adapter without filter glass	1068101

Specifications of the F-Mount adapter

Suitable filter glass, diameter:	29.5 mm - 30.1 mm
Suitable filter glass, thickness:	2.0 mm - 2.5 mm
Maximum protrusion w/ filter:	35.1 mm

Table 8: Specifications of the F-Mount adapter

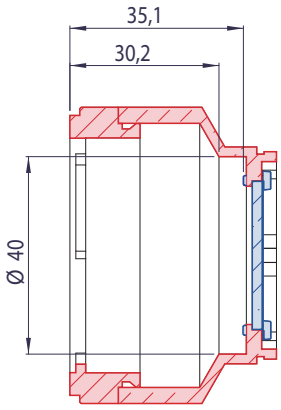


Figure 13: Cross section of the F-Mount adapter (red) with filter (blue) and max. protrusion

Changing the filter of the F-Mount adapter

If the F-Mount adapter has a filter glass fitted, it is possible to change the filter glass. (See section Specific filter applications on page 52 for more details on mount adapters with pre-fitted filters.)

To change the filter glass of the F-Mount lens adapter, follow the instructions below.

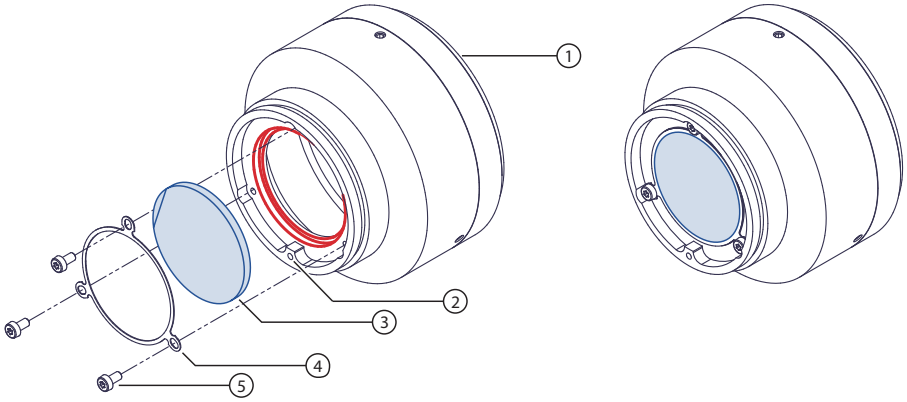


Figure 14: Installing a filter to an F-Mount adapter

1. Remove the lens that might be screwed into the F-Mount adapter.
2. Unscrew the adapter (1) from the camera.
   - Loosen the locking screw (2, shown from back of adapter) on the outside of the mount adapter. See Figure 10 on page 44 for the position of the locking screws.
     Use a 0.9 mm hex key Goldeye G-032 and G-033,
     use a 1.3 mm hex key Goldeye G-032 Cool.
   - To avoid penetration of foreign substances into the camera, ensure that the front flange is covered with a dust cap. See *section Avoiding the necessity of camera cleaning on page 109*.
3. On the back side of the adapter, loosen the three cylinder bolts (5) of the filter fixing ring (4), using a Torx T6 tool.
4. Remove the fixing ring.
5. Remove the existing filter glass (3) from the adapter.
6. Insert the new filter glass into the corresponding recess.
   - See Figure 14 above (blue = filter, red = filter recess).
   - See Table 8 above for dimensions of suitable filter glasses.
7. Reinsert the fixing ring into the adapter.
8. Fix the ring with the three cylinder bolts.
   - Tighten the bolts with a max. torque of 0.25 Nm.

9. Screw the adapter into the camera again.
10. Tighten the locking screw with a max. torque of 0.25 Nm.

M42-Mount

Tip

M42-Mount lens adapter

A separate lens adapter for M42-Mount lenses is available for purchase from Allied Vision. This adapter fits into the M42-Mount of the camera front flange.

For readily assembled mount adapters with special-purpose filter glass see section Specific filter applications on page 52.

Model/Description	Allied Vision order no.
M42/M42-Mount Adapter without filter glass	1068103

Notice

Never use the camera without a mount adapter.

To avoid damaging the sensor or sensor board, never try to screw a lens directly into the M42-Mount of the camera front flange. Always use the M42-Mount adapter when working with M42-lenses.

Specifications of the M42-Mount adapter

Suitable filter glass, diameter:	29.5 mm - 30.1 mm
Suitable filter glass, thickness:	2.0 mm - 2.5 mm
Maximum protrusion w/ filter:	34 mm / 35.8 mm

Table 9: Specifications of the M42-Mount adapter

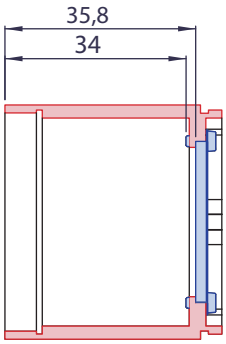


Figure 15: Cross section of the F-Mount adapter (red) with filter (blue) and max. protrusion

Changing the filter of the M42-Mount adapter

If the M42-Mount adapter has a filter glass fitted, it is possible to change the filter glass. (See section Specific filter applications on page 52 for more details on mount adapters with pre-fitted filters.)

To change the filter glass of the M42-Mount adapter, follow the instructions below.

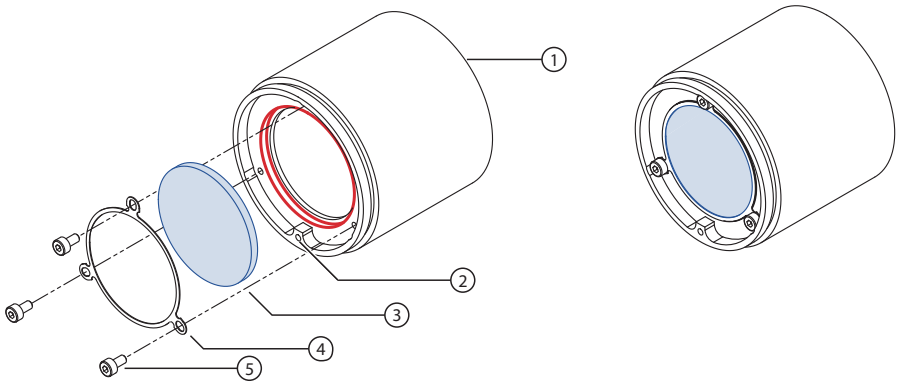


Figure 16: Installing a filter to an M42-Mount adapter

1. Remove the lens that might be screwed into the M42-Mount adapter.
2. Unscrew the adapter (1) from the camera.
   - Loosen the locking screw (2, seen from back of adapter) on the outside of the mount adapter. See Figure 10 on page 44 for the position of the locking screws.
     Use a 0.9 mm hex key Goldeye G-032 and G-033,
     use a 1.3 mm hex key Goldeye G-032 Cool.

- To avoid penetration of foreign substances into the camera, ensure that the front flange is covered with a dust cap. See *section Avoiding the necessity of camera cleaning on page 109*.

3. On the back side of the adapter, loosen the three cylinder bolts (5) of the filter fixing ring (4), using a Torx T6 tool.
4. Remove the fixing ring.
5. Remove the existing filter glass (3) from the adapter.
6. Insert the filter glass into the matching recess.
   - See Figure 16 above (blue = filter, red = filter recess).
   - See Table 9 above for measurements of suitable filter glasses.
7. Reinsert the fixing ring into the adapter.
8. Fix the ring with the three cylinder bolts.
   - Tighten the bolts with a max. torque of 0.25 Nm.
9. Screw the adapter into the camera again.
10. Tighten the locking screw with a max. torque of 0.25 Nm.

Specific filter applications

Bandpass filter

The Goldeye responds to wavelengths from about 900 nm to 1700 nm. It is possible, however, to restrict the complete bandwidth to a certain range of wavelengths by using a corresponding bandpass filter. That way, only a certain wavelength band is transmitted, all others are blocked.

A bandpass filter is described by specific properties, like optical density, spectral profile, etc. The main characteristic, however, is the center wavelength (CWL) together with the bandwidth being transmitted (tolerance), e. g., the transmission range of a water filter displayed in Figure 17 is at 1450 nm with a tolerance of ±50 nm.

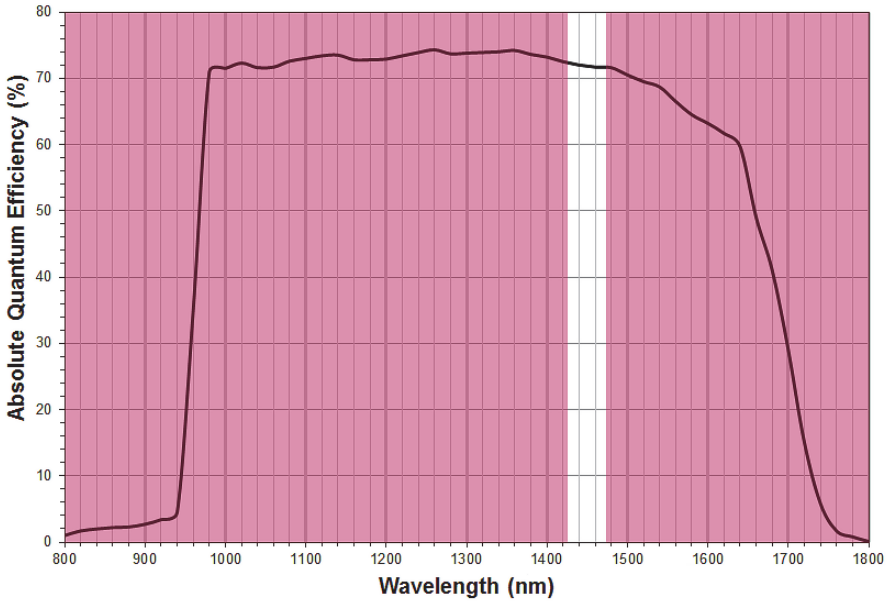


Figure 17: Transmission range of a water filter

Advice **Avoid damage to filter glasses**

To avoid scratching or other damages to filter glasses, always store away unused filter glasses carefully.

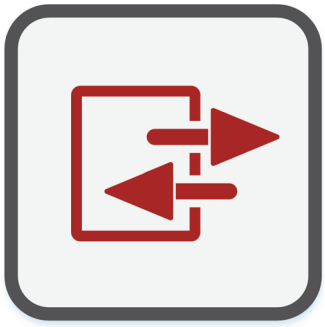
Tip

Bandpass filters 1450 nm (water filter)

Readily assembled mount adapters with filter glass for several lens mounts are available for purchase from Allied Vision.

The lens adapters with bandpass filter already fitted that are listed below have a bandpass filter with a CWL of 1450 nm and a tolerance of ±7 nm .

Model/Description	Allied Vision order no.
C-Mount adapter with 1450 nm BP-Filter	1068140
F-Mount adapter with 1450 nm BP-Filter	1068141
M42-Mount adapter with 1450 nm BP-Filter	1068143



Camera interfaces

This chapter includes:

- A general description of the inputs and outputs of the cameras (incl. trigger features)—Gigabit Ethernet port
- I/O connector pin assignments
- Schematic input/output block diagrams
- A general description of trigger rules such as timing diagram and definitions.

Warning **Observe safety in electrical connections.**

For connections to any power outlet, only use connectors that fit, and/or adapters with a grounding lead.

Use sufficient grounding to minimize the risk of damage.

www **Overview of GigE accessories:**

Allied Vision provides accessories to run and connect the Goldeye. To obtain an overview of all accessories available, go to the Allied Vision GigE Accessories website:

http://www.alliedvision.com/en/support/technical-documentation/accessories-datasheets.html

Gigabit Ethernet

Goldeye G cameras are equipped with a Gigabit Ethernet interface.

GigE GigE is the abbreviation for Gigabit Ethernet.

All Allied Vision Goldeye G cameras are GigE Vision compliant cameras with Gigabit Ethernet interface. Allied Vision Goldeye G cameras work with standard Gigabit Ethernet hardware and cables, and serve cable lengths up to 100 m.

GigE Vision The GigE Vision standard is an interface standard for digital machine vision cameras, developed and maintained by the Automated Imaging Association (AIA). It is built on the Gigabit Ethernet communication protocol and widely supported in the industrial imaging industry.

GenICam GenICam is the command structure for the GigE Vision camera control. GenICam is administered by the European Machine Vision Association (EMVA).

GenICam establishes a common camera control interface so that third-party software can communicate with cameras from various manufacturers without customization. It is incorporated as part of the GigE Vision standard.

Gigabit Ethernet port

The Gigabit Ethernet port conforms to the 1000BASE-T standard for Gigabit Ethernet. We recommend using Cat 6 compatible cabling and connectors for best performance.

www

GigE Installation Manual:

The Allied Vision *GigE Installation Manual* describes the hardware installation procedures for Allied Vision GigE cameras. Additionally, it includes safety instructions, pin assignments on I/O connectors, and GigE port connectors.

The document is available on the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Tip

Quick overview: Ethernet adapter

The Ethernet adapters listed below are available for purchase from Allied Vision.

Model/Description	Allied Vision order no.
Standard adapter Intel CT, PCIe x1, 1 port	02-3003B
Dual port adapter w/o PoE Intel Pro1000/PT, PCIe x4, 2 port	02-3005A
Dual port PoE adapter Adlink GIE62+ PCIe x4, 2 port	2685
Four port PoE adapter Adlink GIE64+ PCIe x4, 4 port	2686

www

Recommended third-party Ethernet adapters:

For a complete list of recommended third-party Ethernet adapters see the *Hardware Selection for Allied Vision GigE Cameras* application note on the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Power Supply

There is a distinctive difference in power supply options between a temperature-stabilized Goldeye G camera and a cooled Goldeye G camera.

G-032, G-033 (Standard)	**G-032 Cool**
Power options via the Hirose connector	
Through the Hirose I/O port, via Pin 1, **External GND,** and Pin 2, **External Power**.	Through the Hirose 4-pin power port, not using Pin 2, **External Power**, of the Hirose I/O port.
Power options via Power over Ethernet	
Through the Gigabit Ethernet port by a **PoE (802.3af/at)** supported network card, switch, or injector.	Through the Gigabit Ethernet port by a **PoE+ (802.3at)**supported network card, switch, or injector.

Table 10: Differences in power supply between different Goldeye G models.

If the Hirose connector provides a valid DC voltage to the camera, and the GigE connector is connected via PoE at the same time, the camera obtains power from the Hirose connector only.

All Goldeye G camera models do not work in reverse polarity.

Power supply via Gigabit Ethernet

You can supply the Goldeye G with power through the Gigabit Ethernet port by using any standard Power over Ethernet (PoE or PoE+) supported network connection.

The pin assignment of the RJ45/8P8C connector is according to the Ethernet standard (IEEE 802.3 1000BASE-T), which supports cable lengths of up to 100 m. All Goldeye G can obtain power from 802.3af/at compliant PSE devices (Power Sourcing Equipment): such as switches, injectors, or NICs.

Power supply via Hirose connector

The Goldeye G can be powered by the I/O port:

- either using a power adapter with Hirose 12-pin connector,
- or using an I/O cable with Hirose 12-pin connector in conjunction with a standard power supply adapter.

The Goldeye G Cool can be powered by the power port:

- either using a power adapter with Hirose 4-pin connector,
- or using a power cable with Hirose 4-pin connector in conjunction with a standard power supply adapter.
- You cannot use the Hirose 12-pin I/O connector to supply the Goldeye G Cool with power.

Advice **Ensure an adequate power supply**

In case the camera is provided with power via the I/O connector, always ensure that the voltage at the camera input lies within the designated requirement of 10.8 V to 30.0 V.

Tip **Minimize power consumption**

If the camera operates under higher temperature conditions, it should be considered to power the camera via the I/O connector instead of PoE, since PoE contributes to the heat build-up inside the camera.

Refer to chapter Technical Data on page 22 for details on power consumption.

Tip **Quick overview: 12-pin Hirose connector**

The cable side Hirose connector (without cable) and I/O cables with Hirose connector are available for purchase from Allied Vision (excerpt only):

Model/Description	Allied Vision order no.
Hirose 12-pin connector w/o cable	K7600040
I/O cable w/ Hirose 12-pin connector, 2 m	2814
I/O cable w/ Hirose 12-pin connector, 3 m	2815
I/O cable w/ Hirose 12-pin connector, 5 m	2817
I/O cable w/ Hirose 12-pin connector, 10 m	2818

Tip **Quick overview: power adapter for Goldeye G**

A 12 V power adapter with Hirose connector is available for purchase from Allied Vision (excerpt only):

Model/Description	Allied Vision order no.
North American supply, 12 V / 1.25 A: Desktop power supply 12-pin Hirose female plug, US plug	02-8003D
European supply: Desktop power supply 12-pin Hirose female plug, EURO plug	02-8004D
Power supply, 12 V DC, 15 W, standard	E3100002

Tip

Quick overview: 4-pin Hirose power connector for Goldeye Cool cameras

The cable side Hirose connector (without cable) and suitable cables with Hirose connector are available for purchase from Allied Vision (excerpt only):

Model/Description	Allied Vision order no.
Hirose 4-pin connector w/o cable	02-7001A
Power cable w/ Hirose 4-pin connector, 2 m	1068904
Power cable w/ Hirose 4-pin connector, 3 m	1068905
Power cable w/ Hirose 4-pin connector, 5 m	1068906
Power cable w/ Hirose 4-pin connector, 10 m	1068907

Tip

Quick overview: power adapter for Goldeye G Cool

A 12 V power adapter with Hirose connector is available for purchase from Allied Vision (for **Goldeye G Cool** only):

Model/Description	Allied Vision order no.
North American and European supply, 12 V / 5 A: Desktop power supply 4-pin Hirose female plug	1021080

The back panel

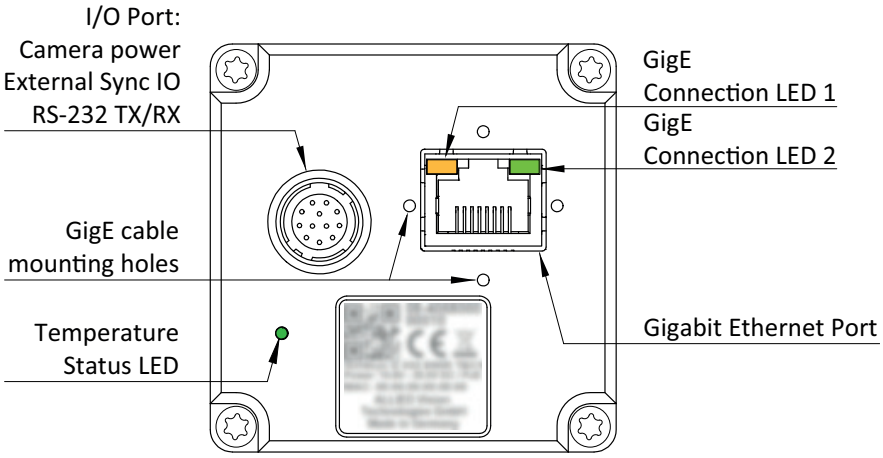


Figure 18: Connection ports and LEDs of a temperature stabilized Goldeye G

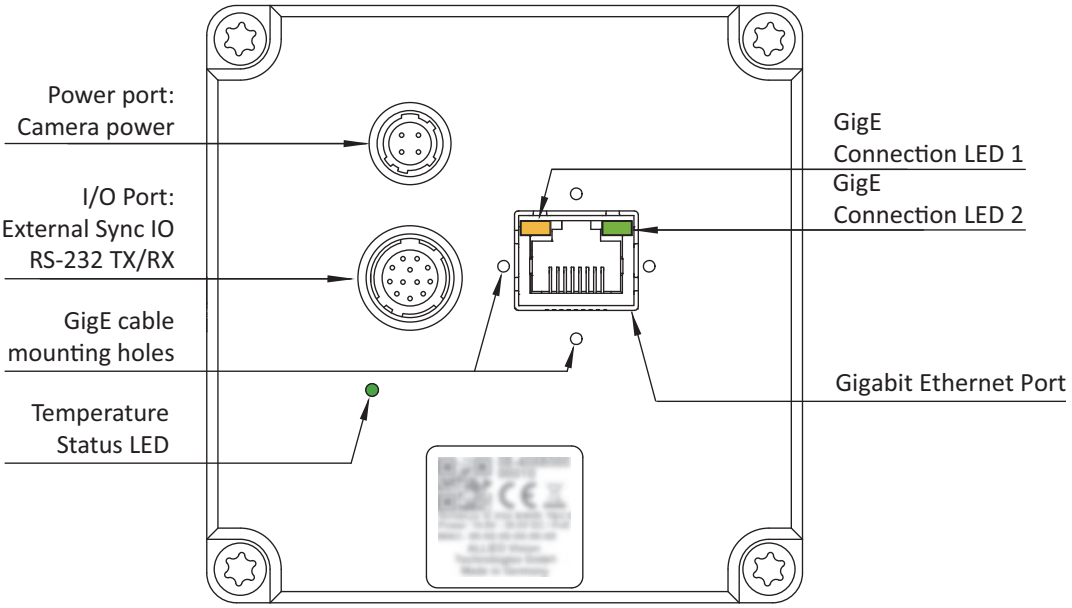


Figure 19: Connection ports and LEDs of a Goldeye G Cool

The Status LEDs

The Goldeye G has the following LEDs on its rear panel:

- Two LEDs at the RJ45/8P8C port showing the GigE connection status.
- One temperature status LED showing the sensor and camera temperature status.

GigE status LEDs

LED	LED color and flashing pattern		Status
LED 1		Amber (flashing or continuous)	Ethernet activity
LED 2		Green (flashing)	Camera is connected to power
		Green (continuous)	Camera is booted, link with the host is established

Table 11: Goldeye G: GigE status LEDs.

Tip **LED 2 remains green while the camera is powered.**

Once the camera is booted, LED2 remains green as long as the camera is connected to power, even if connection with the host is lost.

Temperature status LED

The temperature status LED indicates temperature conditions based on the sensor temperature and the internal camera temperature.

LED color and flashing pattern		Status
	Off	**Off**: Sensor cooling is Off.
	Green-red (flashing)	**Deviated**: Sensor temperature deviates from the setpoint value.
	Green (continuous)	**Stabilized**: Sensor temperature is stable at the setpoint.
	Red (flashing)	**Upper limit**, **Lower limit**: Cooling regulator works at its limit.

Table 12: Goldeye G: Temperature Status LED.

LED color and flashing pattern		Status
	Red (continuous)	**Alert:** Camera temperature above threshold temperature.

Table 12: Goldeye G: Temperature Status LED.

Tip **Read more about temperature management**

For detailed explanations on temperature status and temperature management of the Goldeye G, refer to chapter Temperature control on page 97.

I/O connectors and pin assignment

Notice **Avoid electrostatic discharge.**

Electrostatic sensitive device.

To prevent equipment damage, use proper grounding techniques.

Notice **Avoid electromagnetic interferences.**

For all power and interface connections use only shielded cables.

Connectors

Camera	Connectors	Usage
Goldeye G-032	Hirose 12-pin	External power and I/O
Goldeye G-032 Cool	Hirose 12-pin	I/O
	Hirose 4-pin	External power
Goldeye G-033	Hirose 12-pin	External power and I/O

Table 13: Connectors used for external power and I/O control

I/O types

Non-isolated I/Os:

- One non-isolated line-in (3.3 V LVTTL, 5 V TTL tolerated, see Table 16 on page 65)
- One non-isolated line-out (5 V TTL)

Opto-isolated I/Os:

- One opto-isolated line-in
- Two opto-isolated line-out
- Maximum isolated power voltage is 30 V
- Line-in voltages:
  - V_{in}(low) = 0.0 V to 1.0 V
  - V_{in}(high) = 3.0 V to 24.0 V

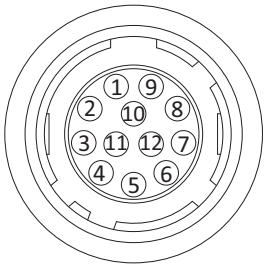
Tip

Quick overview: trigger cables with 12-pin Hirose connector

The cable side Hirose connector (without cable) and I/O cables with Hirose connector are available for purchase from Allied Vision (excerpt only):

Model/Description	Allied Vision order no.
Trigger cable In1 BNC LVTTL w/ Hirose 12-pin connector, 2 m	1068908
Trigger cable In1 BNC LVTTL w/ Hirose 12-pin connector, 5m	1068909

Pin assignment

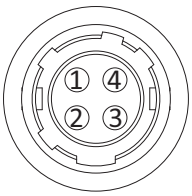


Pin	Signal	I/O	Level	Description
1	External GND	In/ Out	GND for RS-232 and external power	Ext. ground for RS-232, TTL I/Os (and ext. power)
2	External Power	In	10.8 V to 30.0 V DC	Power supply
	Goldeye G Cool: Pin 2 is not connected.			
3	Video Type Auto Iris Out	Out	---	Video iris
4	In 1	In	V_{in} (low) 0.0 V to 0.8 V V_{in} (high) 2.0 V to 5.0 V	Input 1 non-isolated (SyncIn1)
5	Out 3	Out	Open emitter, max. 20 mA	Output 3 opto-isolated (SyncOut3)

Table 14: I/O connector pin assignment for all Goldeye cameras

Pin	Signal	I/O	Level	Description
6	Out 1	Out	TTL (5 V, max. 20 mA)	Output 1 non-isolated (SyncOut1)
7	Isolated In GND	In	Common GND for opto-isolated inputs	Camera common input ground (In GND)
8	RxD RS-232	In	RS-232	Terminal receive data
9	TxD RS-232	Out	RS-232	Terminal transmit data
10	Isolated Out Power	In	Common supply voltage for outputs max. 30 V DC	External power input for digital outputs (Out V_{CC})
11	In 2	In	V_{in} (low) 0.0 V to 1.0 V V_{in} (high) 3.0 V to 24.0 V	Input 2 opto-isolated (SyncIn2)
12	Out 2	Out	Open emitter, max. 20 mA	Output 2 opto-isolated (SyncOut2)

Table 14: I/O connector pin assignment for all Goldeye cameras (continued)



Pin	Signal	I/O	Level	Description
1	External Power	In	10.8 V to 30.0 V DC	External power
2	External Power	In	10.8 V to 30.0 V DC	External power
3	External GND	In	GND external power	Ext. ground for ext. power
4	External GND	In	GND external power	Ext. ground for ext. power

Table 15: Goldeye G Cool power connector pin assignment

I/O definition

External GND and External power (pin 1, pin 2)

Notice **Observe the input voltage.**

Exceeding the 30 V input voltage can permanently damage the camera.

For G-032 and G-033:
Use pin 1 and pin 2 to supply the camera with power.

For G-032 Cool:
Use the Hirose four-pin connector to supply the camera with power.

For more information on power supply refer to section section Power Supply on page 57.

RxD RS-232 and TxD RS-232 (pin 8, pin 9)

These signals are RS-232 compatible. These signals are not optically isolated. Connect RS-232 ground to Camera GND to complete the RS-232 circuit. Communication takes place at a bandwidth of 115,200 baud (customer adjustable).

www

More information on the RS-232 interface:

For complete RS-232 description and usage on GigE cameras, see the application note *RS-232 Port Explained* on the Allied Vision Knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Isolated Out Power (pin 10)

The **Isolated Out Power** must be connected to a power source for isolated signals **Out 2** and **Out 3**. The voltage requirement is 3 to 30 V DC. The current requirement for this supply is a function of the optical insulator collector current and the number of outputs used in the system. **Isolated Out Power** wiring should be physically close to **Out 2 / Out 3** wiring to prevent parasitic coupling.

Input signals

Input signals allow the camera to be synchronized to an external event. The camera can be programmed to trigger on the rising edge, falling edge, both edges, or level of the signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

In 1 - non-isolated (pin 4)

In 1 is not electrically isolated and can be used when environmental noise is inconsequential, and a faster trigger response is required. To complete the trigger circuit, connect trigger ground to External GND.

Required trigger signal:	LVTTL (3.3 V), TTL (5 V) tolerated
Input current to be expected in TTL mode:	3 mA
Input current to be expected in LVTTL mode:	0.3 mA

Table 16: Input 1 trigger signal and input current

In 2 - opto-isolated (pin 11)

In 2 is optically isolated and can be used in electrically noisy environments to prevent false trigger events. To complete the trigger circuit, connect trigger ground to **Isolated In GND**. Compared to the non-isolated trigger, **In 2** has a longer propagation time.

Trigger input voltage: V_{in} (low):	0.0 V to 1.0 V
Trigger input voltage: V_{in} (high):	3.0 V to 24.0 V
Input current to be expected:	5 mA

Table 17: Input 2 trigger signal and input current

Isolated input block diagram

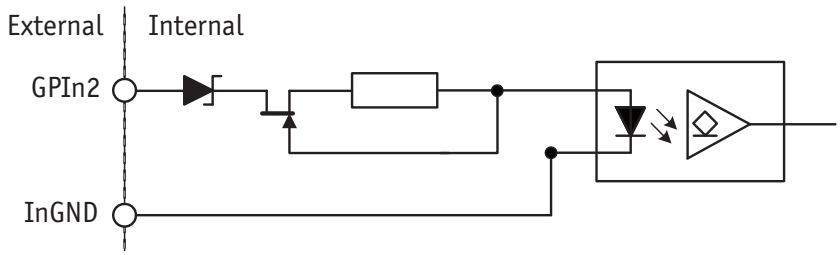


Figure 20: Goldeye G isolated input block diagram

The inputs can be connected directly to the system for voltages up to 24 V DC. An external resistor is not necessary.

Goldeye G isolated input delay and minimum pulse width

The minimum pulse width for all Goldeye G cameras is:

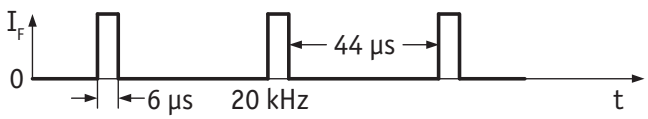


Figure 21: Goldeye G minimum pulse width

Test conditions

The input signal was driven with 3.3 V (LVTTL) and no external additional series resistor was used.

Output signals

Output signals can be assigned to a variety of internal camera signals via software. They can be configured to active high or active low. The internal camera signals are listed in Table 23 on page 71.

Output signal	Description
Exposing	Indicates when camera is integrating light.
Trigger Ready	Indicates when the camera is ready to accept a trigger signal.
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras.
Readout	Valid when the camera is reading out data.
Imaging	Valid when the camera is exposing or reading out.
Strobe	Programmable pulse based on one of the above events.
GPO	User programmable binary output.

Table 18: Internal camera signals available in the Goldeye G

Out 1 - non-isolated (pin 6)

The **Out 1** signal is not electrically isolated and can be used when environmental electrical noise is inconsequential, and faster trigger response is required. Connect signal ground to **External GND** to complete the external circuit.

Output signal	TTL (5 V)
Maximum output current	20 mA

Table 19: Output 1 output signal and maximum current

Tip

Possible low output voltage.

Output voltage may drop **down to 3.5 V** under full load.

Out 2 (pin 12) and Out 3 (pin 5) - opto-isolated

Out 2 and **Out 3** signals are optically isolated and require the user to provide a voltage level at **Isolated Out Power**.

An example of the functional circuit is indicated in Figure 22: Goldeye G isolated output block diagram on page 68.

Possible voltage source $OutV_{CC}$ Range	3 V to 30 V
Maximum output current per output	20 mA

Table 20: Output 2 / output 3 voltage source and current per channel

Tip **Possible low output voltage.**

Output voltage may drop **by 2.5 V** under full load.

The opto-isolated inputs can be connected directly to the system for voltages up to 24 V DC. An external resistor is not necessary.

Isolated output block diagram

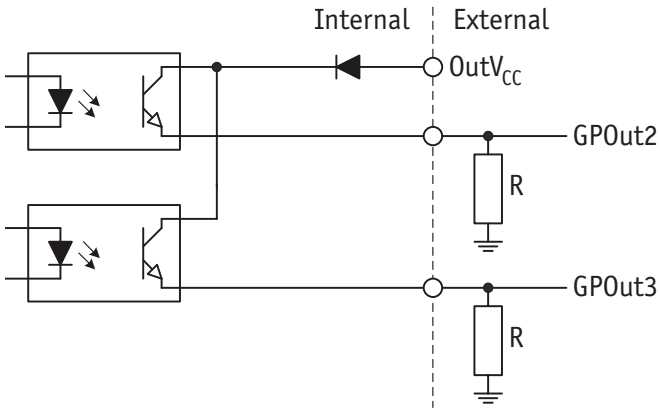


Figure 22: Goldeye G isolated output block diagram

$OutV_{CC}$	Resistor value	
5 V	1.0 kΩ	Minimum required current draw at approx. 5 mA
12 V	2.4 kΩ	
24 V	4.7 kΩ	

Table 21: $OutV_{CC}$ and value of the external resistor

Goldeye G isolated output delay

The output switching times displayed in Figure 23 on page 69 are applicable to opto-isolated outputs only.

Note that higher external resistor values increase the time values listed in Table 22.

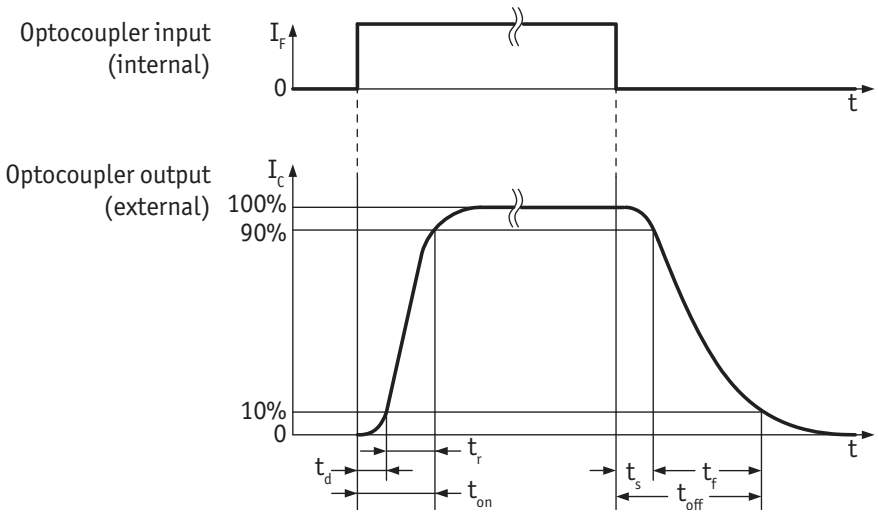


Figure 23: Goldeye G output switching times

Parameter	Value
Delay time	$t_d \approx 1\ \mu s$
Rise time	$t_r \approx 1\ \mu s$
Turn-on time	$t_{on} = t_d + t_r \approx 2\mu s$
Storage time	$t_s \approx 26\ \mu s$
Fall time	$t_f \approx 21\ \mu s$
Turn-off time	$t_{off} = t_s + t_f \approx 47\ \mu s$

Table 22: Parameters and values

Tip **Cycle delay:**

The cycle delay for the Goldeye is as follows:

- t_{pdLH} < 3.5 µs
- t_{pdHL} < 30 µs

For this reason, we recommend to trigger on the rising edge. This ensures the fastest possible reaction time.

Test conditions

- External 2.4 kOhm resistor to GND
- Power input for output ports set to 12 V

Control signals

The inputs and outputs of the camera can be configured by software. The different modes are described below.

www **More details on outputs and warnings:**

For a general description of the outputs and warnings see the *Allied Vision GigE Installation Manual* in the Allied Vision Literature Download Center: http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Inputs

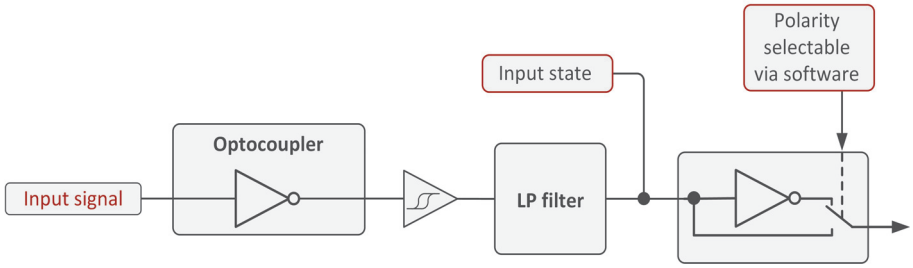


Figure 24: Goldeye G input signal block diagram

Input/output pin control

www

More details on GigE input and output signals:

All input and output signals running over the camera I/O connector are controlled by the I/O strobe commands. For more details see the *Allied Vision GigE Camera and Driver Features* in the Allied Vision Knowledge Base web page: http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Outputs

Output features are configured by software. Any signal can be placed on any output. The main features of the output signals are described in Table 23 on page 71.

Signal	Description
GPO	Configured to be a general purpose output, control of which is assigned to SyncOutGpoLevels.
AcquisitionTriggerReady	Active once the camera has been recognized by the host PC and is ready to start acquisition.
FrameTriggerReady	Active when the camera is in a state that accepts the next frame trigger.
FrameTrigger	Active when an image has been initiated to start. This is a camera-internal logic trigger, which is initiated by an external trigger or software trigger event.
Exposing	Active for the duration of sensor exposure.
FrameReadout	Active during frame readout, i.e., the transferring of image data from the CCD to camera memory.
Imaging	High when the camera image sensor is either exposing and/or reading out data.
Acquiring	Active during an acquisition stream.
SyncIn1	Active when there is an external trigger at SyncIn1.
SyncIn2	Active when there is an external trigger at SyncIn2.
Strobe1	The output signal is controlled according to Strobe1 settings.

Table 23: Goldeye G output signals

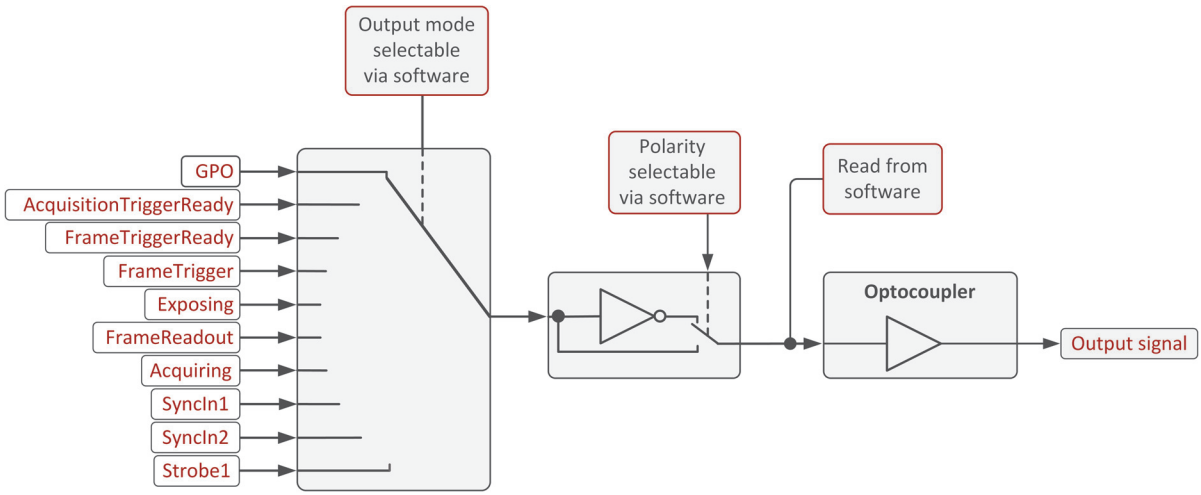
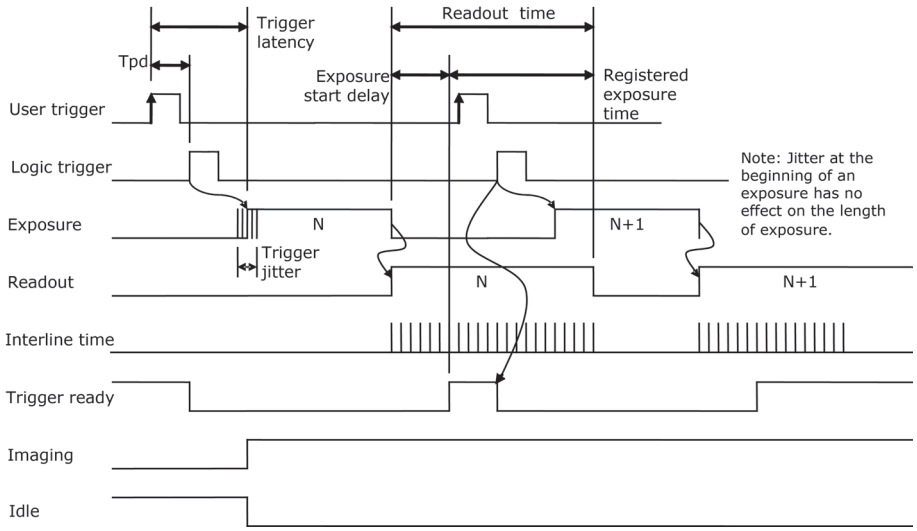


Figure 25: Goldeye G signals output block diagram

Trigger timing diagram

The diagram below explains the trigger concept in general.



www **Trigger descriptions for GigE cameras:**

For trigger descriptions on camera control basis see the *Allied Vision GigE Camera and Driver Features* document in the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Notes on triggering

Trigger definitions

Term	Definition
User trigger	Trigger signal applied by the user (hardware trigger, software trigger).
Logic trigger	Trigger signal seen by the camera internal logic (not visible to the user).
Tpd	Propagation delay between the User trigger and the Logic trigger.
Exposure	High when the camera image sensor is integrating light.
Readout	High when the camera image sensor is reading out data.
Trigger latency	Time delay between the user trigger and the start of exposure.
Trigger jitter	Error in the trigger latency time.
Trigger ready	Indicates to the user that the camera is ready to accept the next trigger.
Registered exposure time	Exposure time value currently stored in the camera memory.
Exposure start delay	Registered Exposure Time subtracted from the Readout time. Exposure start delay indicates when the next exposure cycle can begin such that the exposure end after the current Readout.
Interline time	Time between sensor row readout cycles.
Imaging	High when the camera image sensor is either exposing and/or reading out data.
Idle	High if the camera image sensor is not exposing and/or reading out data.

Table 24: Goldeye G trigger definitions

Trigger rules

Tip **Minimum user trigger pulse width**

The **user trigger pulse width** should be at least three times the width of the trigger latency.

1. The **end of exposure** always triggers the next Readout.

1. The **end of exposure** must always end after the current Readout.
1. The **start of exposure** must always correspond with the Interline Time if Readout is true.
1. **Exposure start delay** is equal to the Readout time less the Registered Exposure Time.

Triggering during the Idle state

For applications requiring the shortest possible trigger latency and the smallest possible trigger jitter the User trigger signal should be applied when Imaging is false and Idle is true. In this case, trigger latency and trigger jitter can be up to 1 line time.

Triggering during the Readout state

For applications requiring the fastest triggering cycle time during which the camera image sensor is exposing and reading out simultaneously, then the User trigger signal should be applied as soon as a valid trigger Ready is detected. In this case, trigger latency and trigger jitter can be up to 1 line time.

www

Triggering concept for GigE cameras (Advanced):

For a more detailed description of the trigger concept for advanced users and special scenarios, see the application note *Triggering Concept for Allied Visio*n GigE Cameras in the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Data processing path

This chapter includes:

- Description of the data processing path of the Goldeye G cameras in block diagrams
- Explanation of the IR-specific image processing features of the Goldeye G firmware
- Listing of all camera control features of the Goldeye G

Image processing chain

The block diagram in Figure 26 illustrates the data flow of image data within the camera. The features of the individual modules are described in more detail on the following pages.

Note that, depending on firmware version, not all of the modules and features shown below are available.

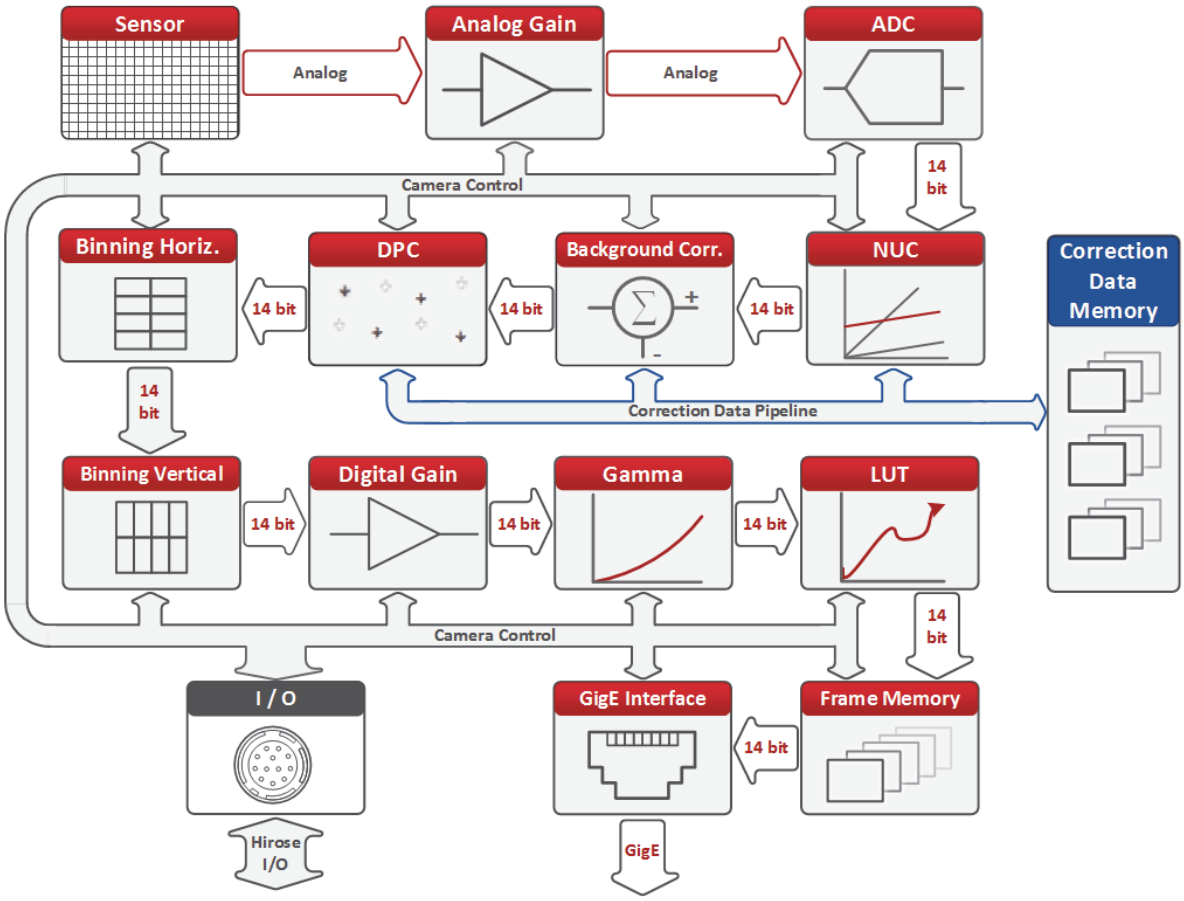


Figure 26: Goldeye G image processing chain

www **GigE camera and driver features:**

You can find a complete list of features in the *Allied Vision GigE Camera and Driver Features* document. It describes the standard and advanced camera controls for Allied Vision GigE cameras as seen from the *Allied Vision Vimba Viewer*.

It is available on the Allied Vision Knowlwdge Base web page: http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

The Goldeye G contains a chain of image processing modules, called the **image processing chain**. The first module (called **Analog Gain**) receives the source signal from the sensor. Each of the subsequent modules receives the output data of the previous module as input.

The behavior of each module is configurable by software via specific GigE features. That way, it is possible to set parameters or operation modes for each module.

Each module passes on the data to the succeeding module. The output of the last module is stored in the frame memory, which in turn passes it on to the GigE interface for output.

Image corrections for SWIR sensors

The corrections applied to the image are of special relevance within the Goldeye camera. They are applied by the following modules.

- Non-uniformity correction (NUC)
- Background correction (BC)
- Defect pixel correction (DPC)

The corrections need special correction data that must be provided prior to operating the image processing chain.

Determination and storage of correction data

For each individual camera, specific correction data is determined during the manufacturing process. All necessary correction data is stored within the camera's non-volatile flash memory ex works.

During camera start-up, the available correction data is copied from the flash memory onto the correction data memory for real time access.

From the correction data memory, the correction data is transferred to the individual correction modules. The correction data transfer is synchronized with the transfer of image data from the sensor. A correction module may also write back to the correction data memory, depending on its functionality.

The IR specific image correction modules are described in detail below.

Non-uniformity correction (NUC)

Every pixel of an InGaAs sensor possesses its individual amount of dark signal (dark signal non-uniformity, DSNU) and an individual sensitivity for light (photo response non-uniformity, PRNU). Thus, while exposing, each sensor creates a specific, non-uniform underlying pattern. This pattern can be compensated with help of the non-uniformity correction.

To correct the non-uniformity, correction values for gain and offset of each pixel are determined on the basis of multiple reference images, and applied to the actual image. Ideally, after correction no image structure is recognizable.

However, there are various conditions that influence the image quality:

- analog gain setting
- sensor temperature
- exposure time

These conditions need corresponding correction data for best correction quality. Thus, the camera contains a number of correction data sets for a range of conditions.

Since each correction data set is applicable under certain conditions only, the relevant conditions are stored with the data set.

An automated data set selection feature keeps track of the conditions. If any of the parameters changes, the most suitable correction data set is selected automatically. No additional user interaction is necessary.

Set to **Continuous**, this function updates the data set selection for every frame.

The table below describes the features to control the Non-uniformity correction and the functionality associated with them.

ImageCorrectionControl / NonUniformityCorrection		
Category for non-uniformity correction control		
NUCMode		
Type:	Command	Controls the operating mode of the non-uniformity correction. Depending on the factory-provided correction data, different modes may be available.
Access:	(R)/W	
Unit:		
Visibility:	Beginner	
Values:	**Off** **OnePoint** **TwoPoint** **ThreePoint**	

Table 25: GenICam features for the non-uniformity correction

ImageCorrectionControl / NonUniformityCorrection		
Category for non-uniformity correction control		
NUCDatasetActive		
Type:	Integer	If **NUCDatasetAuto** is set to **Off**, the dataset currently applied can be changed by writing a dataset index to **NUCDatasetSelector** and executing the **NUCDatasetActivate** command. If **NUCDatasetAuto** is set to **Once** or **Continuous**, the index may change as a result of the automatic data set selection.
Access:	R/(W)	
Unit:		
Visibility:	Beginner	
Values:	The index of the active data set, starting at **0**.	
NUCDatasetActiveDescription		
Type:	String	Gives a short descriptive label to the data set that is currently indexed by the **NUCDatasetActive**.
Access:	R	
Unit:		
Visibility:	Expert	
Values:		
NUCDatasetActiveExposureTime		
Type:	Float	Exposure time at acquisition of the data set that is currently indexed by the **NUCDatasetActive**.
Access:	R	
Unit:	µs	
Visibility:	Expert	
Values:		
NUCDatasetActiveGain		
Type:	Float	Sensor gain setting at acquisition of the data set that is currently indexed by the **NUCDatasetActive**. Depending on camera model different values may occur.
Access:	R	
Unit:		
Visibility:	Expert	
Values:	**0 = Gain0** **1 = Gain1** **2 = Gain2**	
NUCDatasetActiveTemperature		
Type:	Float	Sensor temperature at acquisition of the data set that is currently indexed by the **NUCDatasetActive**.
Access:	R	
Unit:	°C	
Visibility:	Expert	
Values:	[0 - Camera dependent]	

Table 25: GenICam features for the non-uniformity correction (continued)

ImageCorrectionControl / NonUniformityCorrection		
Category for non-uniformity correction control		
NUCDatasetSelector		
Type:	Integer	Selects a data set for access to its properties and activation. The selector only operates as index to data set information and does not change any camera setting. Use **NUCDatasetActivate** to activate the currently indexed data set.
Access:	R/W	
Unit:		
Visibility:	Expert	
Values:		
NUCDatasetActivate		
Type:	Command	Activate the data set that is currently indexed by the **NUCDatasetSelector**.
Access:	(R)/W	
Unit:		
Visibility:	Beginner	
Values:		
NUCDatasetAuto		
Type:	Enum	Controls the automatic data set selection of the non-uniformity correction. In **Continuous** mode the camera will select the best correction data set for every frame, according to current analog gain setting, sensor temperature and exposure time. **Once** activates the selection only for the next image output, then falls back to **Off**. Automatic dataset selection does not work if the exposure time is controlled by an external signal applied to a camera input. Note: In **Continuous** mode the data set may toggle too frequently. If this happens, try executing the **Once** setting occasionally.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Off**, **Once**, **Continuous** (default)	
		This toggle effect can be caused by external trigger signal, or an inappropriate temperature setpoint of the sensor.
NUCDatasetDescription		
Type:	String	Gives a short descriptive label to the data set that is currently indexed by the **NUCDatasetSelector**.
Access:	R	
Unit:		
Visibility:	Expert	
Values:		

Table 25: GenICam features for the non-uniformity correction (continued)

ImageCorrectionControl / NonUniformityCorrection		
Category for non-uniformity correction control		
NUCDatasetExposureTime		
Type:	Float	Exposure time at acquisition of the data set that is currently indexed by the **NUCDataset-Selector**.
Access:	R	
Unit:	µs	
Visibility:	Expert	
Values:		
NUCDatasetGain		
Type:	Float	Sensor gain setting at acquisition of the data set that is currently indexed by the **NUC-DatasetSelector**. Depending on camera model different values may occur.
Access:	R	
Unit:		
Visibility:	Expert	
Values:	**0 = Gain0** **1 = Gain1** **2 = Gain2**	
NUCDatasetTemperature		
Type:	Float	Sensor temperature at acquisition of the data set that is currently indexed by the **NUCDatasetSelector**.
Access:	R	
Unit:	°C	
Visibility:	Expert	
Values:	[0 - Camera dependent]	
NUCDatasetNodeSelector		
Type:	Integer	Selects a point of a data set for access to it's properties, starting at **0**, i.e. the two point correction allows to address two points here. The selector only operates as index to node information in the data set indexed by **NUC-DatasetSelector**. It does not change any camera setting.
Access:	R	
Unit:		
Visibility:	Expert	
Values:	[0 - Camera dependent]	
NUCDatasetNodeValue		
Type:	Float	The set value of the selected data point that is currently indexed by the **NUCDatasetSe-lector** and the **NUCDatasetNodeSelector**.
Access:	R	
Unit:		
Visibility:	Expert	
Values:		

Table 25: GenICam features for the non-uniformity correction (continued)

Background correction (BC)

The background correction is used as an additional correction, based on actual operating conditions, to optimize the result of the non-uniformity correction.

The correction data for the non-uniformity correction is factory-provided and based on specific conditions: exposure time, sensor temperature, and sensor gain setting. If the conditions during camera operation are different, non-uniformity correction does not work at best performance.

To compensate for remaining non-uniformity, the live image is corrected with a previously recorded dark image. This image is subtracted from the precorrected image to reduce the fixed pattern noise.

In order to adapt the background correction to local conditions, customers acquire their own volatile correction image. It is also possible to shift the offset individually, if needed.

The table below describes the features controlling the background correction and the functionality associated with them.

ImageCorrectionControl / BackgroundCorrection		
Category for background correction control		
BCDatasetMeanValue		
Type:	Integer	Provides the mean value of the correction image.
Access:	R	
Unit:		
BCDatasetMeanValue (continued)		
Visibility:	Beginner	Copy the value to **BCDatasetOffsetValue** to get the same brightness level behind the active background correction as the uncorrected image has.
Values:		
BCDatasetOffsetValue		
Type:	Integer	Specifies the output offset of the corrected image. The scale is always based on the maximum pixel depth the camera supports, independent of the active output pixel format.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:		

Table 26: GenICam features for the background correction

ImageCorrectionControl / BackgroundCorrection		
Category for background correction control		
BCDatasetROIHeight		
Type:	Integer	Provide the height of the integrated correction image. The background correction stays active as long as the current active image region fully fits into the region of interest of the correction image. See also **BCState** feature.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	Same as **Height** feature.	
BCDatasetROIOffsetX		
Type:	Integer	Provide the horizontal offset of the integrated correction image. The background correction stays active as long as the current active image region fully fits into the region of interest of the correction image. See also **BCState** feature.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	Same as **OffsetX** feature.	
BCDatasetROIOffsetY		
Type:	Integer	Provide the vertical offset of the integrated correction image. The background correction stays active as long as the current active image region fully fits into the region of interest of the correction image. See also **BCState** feature.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	Same as **OffsetY** feature.	
BCDatasetROIWidth		
Type:	Integer	Provide the width of the integrated correction image. The background correction stays active as long as the current active image region fully fits into the region of interest of the correction image. See also **BCState** feature.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	Same as **Width** feature.	
BCDatasetIntegrationAbort		
Type:	Command	Cancels the image integration process.
Access:	(R)/W	
Unit:		
Visibility:	Beginner	
Values:		

Table 26: GenICam features for the background correction (continued)

ImageCorrectionControl / BackgroundCorrection		
Category for background correction control		
BCDatasetIntegrationMode		
Type:	Enum	Change the mode how a correction image is acquired. **Integrate**: After submission of **BCIntegrationStart** a correction image which is the mean of **BCIntegrationFrameCount** images will be acquired. **FrameBuffer**: Store every frame to the correction memory and use the previously stored image for correction. If **BCMode** is **On** this can be used to get a dynamic frame-to-frame difference of the live image. Use **BCIntegrationStart** to start the FrameBuffer writing, set **BCIntegrationMode** to Integrate to stop it.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Integrate** **FrameBuffer**	
BCDatasetIntegrationStart		
Type:	Command	Starts the integration of the defined number of images with the next frame. Use the features from the AcquisitionControl category to generate a sufficient number of images.
Access:	(R)/W	The resulting correction image is the mean of all integrated images. For optimal correction results integrate a dark image with the same camera settings as used later when the background correction is applied. Especially the effective sensor gain setting, sensor temperature and exposure time influence the fixed pattern.
Unit:		
Visibility:	Beginner	
Values:		
BCIntegrationFrameCount		
Type:	Integer	Number of frames to integrate after submission of the command **BCIntegrationStart**. Integrating more images improves the correction quality, as the influence of dynamic noise to the correction image is reduced.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**1**, **2**, **4**	

Table 26: GenICam features for the background correction (continued)

ImageCorrectionControl / BackgroundCorrection		
Category for background correction control		
BCMode		
Type:	Enum	Selects the background correction mode. **On**: the current correction image - if valid, see **BCState** - is subtracted from the live image and the **BCDatasetOffsetValue** is added. **OffsetOnly**: **BCDatasetOffsetValue** is added to the live image. **ReferenceImage**: the current correction image - if valid, see **BCState** - is output, instead of the live image.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Off** **On** **OffsetOnly** **ReferenceImage**	
BCState		
Type:	Enum	Shows the current state of the background correction processing. If the state is **OK**, then the BC is operating normally as configured with **BCMode**. Otherwise the ROI settings might be out of the valid range of the integrated correction image (**ROIOutOfBounds**), or a new integration might be needed or is still in progress (**DatasetInvalid**).
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	**OK** **DatasetInvalid** **ROIOutOfBounds**	

Table 26: GenICam features for the background correction (continued)

Defect pixel correction (DPC)

The pixels of InGaAs sensors may show abnormal behavior in one or more of the three characteristics:

- dark offset
- photo response
- dynamic noise

The result is an excessively reduced dynamic range. These pixels are counted as defect pixels.

The value of each defect pixel is replaced by an interpolated value from non-defect neighboring pixels. This way, the image appears without disturbing bright or dark pixels.

The table below describes the features to control the defect pixel correction and the functionality associated with them.

ImageCorrectionControl / DefectPixelCorrection		
Category for defect pixel correction control		
DPCMode		
Type:	Enum	Controls the operation mode of the defect pixel correction.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Off**, **On**	
DPCDatasetActive		
Type:	Integer	The index of the active data set, starting at **0**.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	[0 - Camera dependent]	
DPCDatasetActiveDescription		
Type:	String	Gives a short descriptive label to the data set that is currently indexed by the **DPCDatasetActive**.
Access:	R	
Unit:		
Visibility:	Expert	
Values:		
DPCDatasetSelector		
Type:	Integer	Selects a data set for access to its properties. The selector only operates as index to data set information and does not change any camera setting. Use **DPCDatasetActivate** to activate the currently indexed data set.
Access:	R/W	
Unit:		
Visibility:	Expert	
Values:	[0 - Camera dependent]	
DPCDatasetActivate		
Type:	Command	Activates the currently selected dataset, indexed by **DPCDatasetSelector**.
Access:	R/W	
Unit:		
Visibility:	Expert	
Values:		

Table 27: GenICam features for the defect pixel correction

ImageCorrectionControl / DefectPixelCorrection		
Category for defect pixel correction control		
DPCDatasetDescription		
Type:	String	Gives a short descriptive label to the data set that is currently indexed by the **DPCDataset-Selector**.
Access:	R	
Unit:		
Visibility:	Expert	
Values:		

Table 27: GenICam features for the defect pixel correction (continued)

Frame memory

Usually, each image is captured and transmitted in consecutive steps. The image is taken, read out from the sensor, digitized and transmitted to the PC over the Gigabit Ethernet network.

Goldeye cameras are equipped with 256 MiB of RAM for buffering the frames before transmission. Table 28 on page 87 shows how many frames can be stored by each model.

Tip

Number of frames in the frame memory

The number of frames (*StreamHoldCapacity*) depends on the resolution and pixel format. The listed number of frames is valid for full resolution and Mono14.

The memory operates as a FIFO (first in, first out) buffer. Addressing individual images is not necessary.

Model	Memory size	Pixel format/resolution
G-032	256 MiB memory: 409 frames	Mono14/ full resolution
G-033	256 MiB memory: 409 frames	Mono14/ full resolution

Table 28: Image memory size (typical, see note above)

Available Goldeye camera controls

All GigE camera controls of the Goldeye are fully SFNC compliant. Table 29 below lists all features available with the Goldeye, and the associated category structure.

www

GigE camera and driver features:

For detailed information on camera controls, read the *Allied Vision GigE Camera and Driver Features* document. It describes the standard and advanced camera controls for Allied Vision GigE cameras as seen from the *Allied Vision Vimba Viewer* or GenICam compliant 3rd-party software solutions.

The document is available on the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Tip

Use the Vimba SDK or the PvAPI SDK

To display the features of the Goldeye, Allied Vision recommends to use the Allied Vision Vimba Viewer. However, it is also possible to display the features with the PvAPI SDK.

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
AcquisitionControl			
		AcquisitionAbort	AcquisitionAbort
		AcquisitionFrameCount	AcquisitionFrameCount
		AcquisitionFrameRate	AcquisitionFrameRate
		AcquisitionFrameRateLimit	AcquisitionFrameRateLimit
		AcquisitionMode	AcquisitionMode
		AcquisitionStart	AcquisitionStart
		AcquisitionStop	AcquisitionStop
		ExposureAuto	ExposureAuto
		ExposureMode	ExposureMode
		ExposureTime	ExposureTime
		IntegrationMode	IntegrationMode

Table 29: GigE camera controls of the Goldeye

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
		RecorderPreEventCount	RecorderPreEventCount
		TriggerActivation	TriggerActivation
		TriggerDelay	TriggerDelay
		TriggerMode	TriggerMode
		TriggerOverlap	TriggerOverlap
		TriggerSelector	TriggerSelector
		TriggerSoftware	TriggerSoftware
		TriggerSource	TriggerSource
AnalogControl			
		SensorGain	SensorGain
BufferHandlingControl			
		StreamAnnounceBufferMinimum	StreamAnnounceBufferMinimum
		StreamAnnouncedBufferCount	StreamAnnouncedBufferCount
		StreamBufferHandlingMode	StreamBufferHandlingMode
ChunkDataControl			
		ChunkModeActive	ChunkModeActive
		NonImagePayloadSize	NonImagePayloadSize
DeviceControl			
		BandwidthControlMode	BandwidthCtrlMode
		DeviceFamilyName	DeviceFamilyName
		DeviceFanMode	DeviceFanMode
		DeviceFanRpm	DeviceFanRpm
		DeviceFanSelector	DeviceFanSelector
		DeviceFirmwareVersion	DeviceFirmwareVersion
		DeviceLinkHeartbeatTimeout	DeviceLinkHeartbeatTimeout
		DeviceLinkSelector	DeviceLinkSelector
		DeviceLinkThroughputLimit	DeviceLinkThroughputLimit
		DeviceLinkThroughputLimitMode	DeviceLinkThroughputLimitMode
		DeviceModelName	DeviceModelName
		DeviceRelativeHumidity	DeviceRelativeHumidity
		DeviceRelativeHumiditySelector	DeviceRelativeHumiditySelector
		DeviceSFNCVersionMajor	DeviceSFNCVersionMajor
		DeviceSFNCVersionMinor	DeviceSFNCVersionMinor
		DeviceSFNCVersionSubMinor	DeviceSFNCVersionSubMinor
		DeviceScanType	DeviceScanType
		DeviceSerialNumber	DeviceSerialNumber
		DeviceStreamChannelPacketSize	DeviceStreamChannelPacketSize

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
		DeviceStreamChannelSelector	DeviceStreamChannelSelector
		DeviceTLType	DeviceTLType
		DeviceTemperature	DeviceTemperatureMainboard
		DeviceTemperatureSelector	DeviceTemperatureSelector
		DeviceType	DeviceType
		DeviceUserID	DeviceUserID
		DeviceVendorName	DeviceVendorName
		SensorCoolingPower	SensorCoolingPower
		SensorTemperatureControlMode	SensorTemperatureControlMode
		SensorTemperatureControlState	SensorTemperatureControlState
		SensorTemperatureSetpointActivate	SensorTemperatureSetpointActivate
		SensorTemperatureSetpointActive	SensorTemperatureSetpointActive
		SensorTemperatureSetpointMode	SensorTemperatureSetpointMode
		SensorTemperatureSetpointSelector	SensorTemperatureSetpointSelector
		SensorTemperatureSetpointValue	SensorTemperatureSetpointValue
		TimestampLatch	TimestampLatch
		TimestampLatchValue	TimestampLatchValue
		TimestampReset	TimestampReset
DigitalIOControl			
	LineIn		
		LineInGlitchFilter	LineInGlitchFilter
		LineInLevels	LineInLevels
		LineInSelector	LineInSelector
DigitalIOControl			
	LineOut		
		LineOutLevels	LineOutLevels
		LineOutPolarity	LineOutPolarity
		LineOutSelector	LineOutSelector
		LineOutSource	LineOutSource
DigitalIOControl			
	Strobe		
		StrobeDelay	StrobeDelay
		StrobeDuration	StrobeDuration
		StrobeDurationMode	StrobeDurationMode
		StrobeSource	StrobeSource
EventControl			
		EventNotification	EventNotification0

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
		EventSelector	EventSelector
		EventsEnable1	EventsEnable1
EventControl			
	EventData		
		EventAcquisitionEndFrameID	EventAcquisitionEndFrameID
		EventAcquisitionEndTimestamp	EventAcquisitionEndTimestamp
		EventAcquisitionRecordTriggerFram-eID	EventAcquisitionRecordTriggerFram-eID
		EventAcquisitionRecordTriggerTime-stamp	EventAcquisitionRecordTriggerTime-stamp
		EventAcquisitionStartFrameID	EventAcquisitionStartFrameID
		EventAcquisitionStartTimestamp	EventAcquisitionStartTimestamp
		EventErrorFrameID	EventErrorFrameID
		EventErrorTimestamp	EventErrorTimestamp
		EventExposureEndFrameID	EventExposureEndFrameID
		EventExposureEndTimestamp	EventExposureEndTimestamp
		EventFrameTriggerFrameID	EventFrameTriggerFrameID
		EventFrameTriggerTimeStamp	EventFrameTriggerTimeStamp
		EventFrameTriggerReadyFrameID	EventFrameTriggerReadyFrameID
		EventFrameTriggerReadyTimestamp	EventFrameTriggerReadyTimestamp
		EventLine1FallingEdgeFrameID	EventLine1FallingEdgeFrameID
		EventLine1FallingEdgeTimestamp	EventLine1FallingEdgeTimestamp
		EventLine1RisingEdgeFrameID	EventLine1RisingEdgeFrameID
		EventLine1RisingEdgeTimestamp	EventLine1RisingEdgeTimestamp
		EventLine2FallingEdgeFrameID	EventLine2FallingEdgeFrameID
		EventLine2FallingEdgeTimestamp	EventLine2FallingEdgeTimestamp
		EventLine2RisingEdgeFrameID	EventLine2RisingEdgeFrameID
		EventLine2RisingEdgeTimestamp	EventLine2RisingEdgeTimestamp
		EventOverflowFrameID	EventOverflowFrameID
		EventOverflowTimestamp	EventOverflowTimestamp
EventControl			
	EventID		
		EventAcquisitionEnd	EventAcquisitionEnd
		EventAcquisitionRecordTrigger	EventAcquisitionRecordTrigger
		EventAcquisitionStart	EventAcquisitionStart
		EventError	EventError
		EventExposureEnd	EventExposureEnd

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
		EventFrameTrigger	EventFrameTrigger
		EventFrameTriggerReady	EventFrameTriggerReady
		EventLine1FallingEdge	EventLine1FallingEdge
		EventLine1RisingEdge	EventLine1RisingEdge
		EventLine2FallingEdge	EventLine2FallingEdge
		EventLine2RisingEdge	EventLine2RisingEdge
		EventOverflow	EventOverflow
		EventPtpSyncLocked	EventPtpSyncLocked
		EventPtpSyncLost	EventPtpSyncLost
FileAccessControl			
		FileAccessBuffer	FileAccessBuffer
		FIleAccessLength	FIleAccessLength
		FileAccessOffset	FileAccessOffset
		FileAttribute	FileAttribute
		FileAttributBuffer	FileAttributBuffer
		FileDescription	FileDescription
		FileDescriptionBuffer	FileDescriptionBuffer
		FileOpenMode	FileOpenMode
		FileOperationExecute	FileOperationExecute
		FileOperationResult	FileOperationResult
		FileOperationSelector	FileOperationSelector
		FileOperationStatus	FileOperationStatus
		FileSelector	FileSelector
		FileSize	FileSize
		FileStatus	FileStatus
		FileType	FileType
		FileTypeBuffer	FileType
GigE			
		GevSCPSPacketSize	GevSCPSPacketSize
GigE			
	Configuration		
		GevIPConfigurationMode	GevIPConfigurationMode
GigE			
	Current		
		GevCurrentDefaultGateway	GevCurrentDefaultGateway
		GevCurrentIPAddress	GevCurrentIPAddress
		GevCurrentSubnetMask	GevCurrentSubnetMask

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
GigE			
	GVCP		
		GVCPCmdRetries	GVCPCmdRetries
		GVCPCmdTimeout	GVCPCmdTimeout
		GevHeartbeatInterval	GevHeartbeatInterval
GigE			
	Persisten		
		GevPersistenDefaultGateway	GevPersistenDefaultGateway
		GevPersistenIPAddress	GevPersistenIPAddress
		GevPersistenSubnetMask	GevPersistenSubnetMask
ImageCorrectionControl			
	BackgroundCorrection		
		BCDatasetMeanValue	BCDatasetMeanValue
		BCDatasetOffsetValue	BCDatasetOffsetValue
		BCDatasetROIHeight	BCDatasetROIHeight
		BCDatasetROIOffsetX	BCDatasetROIOffsetX
		BCDatasetROIOffsetY	BCDatasetROIOffsetY
		BCDatasetROIWidth	BCDatasetROIWidth
		BCIntegrationAbort	BCIntegrationAbort
		BCIntegrationFrameCount	BCIntegrationFrameCount
		BCIntegrationMode	BCIntegrationMode
		BCIntegrationStart	BCIntegrationStart
		BCMode	BCMode
		BCState	BCState
ImageCorrectionControl			
	DefectPixelCorrection		
		DPCDatasetActivate	DPCDatasetActivate
		DPCDatasetActive	DPCDatasetActive
		DPCDatasetActiveDescription	DPCDatasetActiveDescription
		DPCDatasetDescription	DPCDatasetDescription
		DPCDatasetSelector	DPCDatasetSelector
		DPCMode	DPCMode
ImageCorrectionControl			
	NonUniformityCorrection		
		NUCDatasetActivate	NUCDatasetActivate
		NUCDatasetActive	NUCDatasetActive
		NUCDatasetActiveDescription	NUCDatasetActiveDescription

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
		NUCDatasetActiveExposureTime	NUCDatasetActiveExposureTime
		NUCDatasetActiveGain	NUCDatasetActiveGain
		NUCDatasetActiveTemperature	NUCDatasetActiveTemperature
		NUCDatasetAuto	NUCDatasetAuto
		NUCDatasetDescription	NUCDatasetDescription
		NUCDatasetExposureTime	NUCDatasetExposureTime
		NUCDatasetGain	NUCDatasetGain
		NUCDatasetNodeSelector	NUCDatasetNodeSelector
		NUCDatasetNodeValue	NUCDatasetNodeValue
		NUCDatasetSelector	NUCDatasetSelector
		NUCDatasetTemperature	NUCDatasetTemperature
		NUCMode	NUCMode
ImageFormatControl			
		Height	Height
		HeightMax	HeightMax
		ImageSize	ImageSize
		OffsetX	OffsetX
		OffsetY	OffsetY
		PixelFormat	PixelFormat
		SensorBits	SensorBits
		SensorHeight	SensorHeight
		SensorOffsetX	SensorOffsetX
		SensorOffsetY	SensorOffsetY
		SensorType	SensorType
		SensorWidth	SensorWidth
		Width	Width
		WidthMax	WidthMax
Info			
		GevDeviceMACAddress	GevDeviceMACAddress
		DevicePartNumber	DevicePartNumber
		FirmwareVerBuild	FirmwareVerBuild
		FirmwareVerMajor	FirmwareVerMajor
		FirmwareVerMinor	FirmwareVerMinor
Stream			
	Info		
		GVSPFilterVersion	GVSP Filter Version
Stream			

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
	Multicast		
		MulticastEnable	Multicast Enable
		MulticastIPAddress	Multicast IP Address
Stream			
	Settings		
		GVSPAdjustPacketSize	GVSP Adjust Packet Size
		GVSPBurstSize	GVSP Burst Size
		GVSPDriverSelector	GVSP Driver Selector
		GVSPHostReceiveBuffers	GVSP Host Receive Buffers
		GVSPMaxLookBack	GVSP Max Look Back
		GVSPMaxRequests	GVSP Max Requests
		GVSPMaxWaitSize	GVSP Max Wait Size
		GVSPMissingSize	GVSP Missing Size
		GVSPPacketSize	GVSP Packet Size
		GVSPTiltingSize	GVSP Tilting Size
		GVSPTimeout	GVSP Timeout
Stream			
	Statistics		
		StatFrameDelivered	Stat Frames Delivered
		StatFrameDropped	Stat Frames Dropped
		StatFrameRate	Stat Frame Rate
		StatFrameRescued	Stat Frames Rescued
		StatFrameShoved	Stat Frames Shoved
		StatFrameUnderrun	Stat Frames Underrun
		StatLocalRate	Stat Local Rate
		StatPacketErrors	Stat Packets Errors
		StatPacketMissed	Stat Packets Missed
		StatPacketReceived	Stat Packets Received
		StatPacketRequested	Stat Packets Requested
		StatPacketResent	Stat Packets Resent
		StatTimeElapsed	Stat Time Elapsed
StreamInformation			
		StreamID	StreamID
		StreamType	StreamType
TransportLayerControl			
		PayloadSize	PayloadSize
TransportLayerControl			

Table 29: GigE camera controls of the Goldeye (continued)

Categories 1. and 2. level			
		Feature name GigE	**Displayname PvAPI**
	GigEVision		
		GevCurrentIPConfigurationDHCP	GevCurrentIPConfigurationDHCP
		GevCurrentIPConfigurationLLA	GevCurrentIPConfigurationLLA
		GevCurrentIPConfigurationPer-sistentIP	GevCurrentIPConfigurationPersisten-tIP
		GevInterfaceSelector	GevInterfaceSelector
		GevMACAddress	Device MAC address
TransportLayerControl			
	GVCP		
		GVCPCmdRetries	Command Retries
		GVCPCmdTimeout	Command Timeout
		GVCPHBInterval	Heartbeat Interval
TransportLayerControl			
	StreamHold		
		StreamHoldCapacity	StreamHoldCapacity
		StreamHoldEnable	StreamHoldEnable
UserSetControl			
		UserSetDefault	UserSetDefault
		UserSetLoad	UserSetLoad
		UserSetSave	UserSetSave
		UserSetSelector	UserSetSelector

Table 29: GigE camera controls of the Goldeye (continued)

Temperature control

This chapter includes:

- Information about the principle and functionalities of temperature control and sensor cooling of the Goldeye G.

Caution **Burns to the skin possible if camera housing is hot**

The camera housing may heat up during operation. Touching the camera with bare hands may lead to injuries.

Wear protective gloves when touching a heated-up camera during operation.

Also, use proper heat dissipation methods to keep the camera as cool as possible.

Principle of operation

During operation, power consumed and dissipated by the internal electronic components causes the interior and case of the camera to heat up.

An increase in sensor temperature has a negative impact on the image quality of the InGaAs sensor (FPA), for several reasons.

- The dark current of the FPA's photo diodes increases: as a rule of thumb, a temperature increase of 8 K doubles the dark current. The dark current produces additional noise, especially at longer exposure times, which causes a decrease in image contrast.
- The spectral sensitivity may change: a difference in temperature may cause the sensitivity curve to drift or to become slightly narrower.
- Certain components of the InGaAs sensor are prone to temperature drift.

Therefore, to ensure a consistently optimum image quality, the influence of temperature change needs to be minimized. Two measures are taken to achieve this:

1. Temperature control of the sensor
2. Neutralization of the temperature influence

These measures are described in detail below.

Warm-up period

After switching on the camera, the sensor temperature stabilizes and optimal image quality is reached within one minute.

The **Stable** temperature state is indicated by the green temperature status LED.

Temperature control of the sensor

The InGaAs sensor is affected by temperature in two ways:

1. Fluctuation of temperature:

   If the temperature influence on the sensor remains constant, this ensures constantly high image quality. To achieve this, the temperature of the sensor is stabilized at one of several defined setpoints.

   For the Goldeye G, three setpoints are defined.

2. If the absolute temperature of the sensor is reduced, this decreases the dark current, thus further increasing the dynamic range of the camera.

Temperature control of the sensor is accomplished in multiple ways:

- All Cameras of the Goldeye family are equipped with thermoelectric cooling (TEC) to keep the sensor at a stable temperature that is lower than the ambient temperature.
- The specially designed Goldeye housing dissipates the heat build-up inside the camera and radiates the heat into the environment.
- In addition, Goldeye Cool cameras are equipped with a two-stage thermoelectric cooling (TEC2). This allows to operate the sensor at a very low temperature, thus keeping a higher image contrast even with longer exposures.
- To actively dissipate the heat that builds up internally, Goldeye G Cool cameras are equipped with a fan.

Tip **Reduce power consumption of the camera**

Reducing the camera's operating temperature can reduce its typical power consumption significantly for a given temperature setpoint.

The TEC works more efficiently if the temperature difference between the cool side and the warm side of the TEC is decreased.

Notice **Do not cover the fan outlet**

Always ensure that a free flow of air from the fan outlet on the camera top is possible.

Obstructing the air flow may result in an early and unnecessary shut-down of the camera.

Neutralization of the temperature influence

To neutralize the temperature influence on the non-uniformity, the TEC element keeps the sensor temperature at predefined setpoints. For each setpoint, a set of correction data is applied to the output signal. This correction data set is predetermined for each camera individually, and is uploaded into the camera after manufacturing.

Temperatures and Values				
Model	1	2	3	4
G-032	+5 °C	+20 °C (Default)	+35 °C	+50 °C
G-032 Cool	-20 °C (Default)	-10 °C	+5 °C	n/a
G-033	+5 °C	+20 °C (Default)	+35 °C	+50 °C

Table 30: Defined temperature setpoints for Goldeye cameras

The cooling power and heat dissipation capability of the Goldeye is limited. Therefore, the temperature difference achievable by the TEC is limited as well. Table 31 below displays the maximum temperature difference, and the maximum power necessary to achieve that.

	Max. power consumption for cooling	Min. ΔT between housing and FPA
G-032	< 5.5 W	30 K
G-032 Cool	< 12 W	60 K
G-033	< 4 W	25 K

Table 31: Cooling limits for Goldeye G-032 and G-033

Tip

Example for Goldeye G-032

For this example, let's say that during operation, the housing temperature of a Goldeye G-032 has leveled at approx. +45 °C.

Since the temperature difference achievable is 30 K, the set-point at +5 °C cannot be reached.

Thus, the Goldeye will switch to the lowest possible setpoint at +20 °C.

Example for Goldeye G-032 Cool

For this example, let's say that during operation, the housing temperature of a Goldeye G-032 Cool has leveled at approx. +35 °C.

Since the temperature difference achievable is 60 K, the lowest setpoint at -20 °C can still be reached.

Thus, the Goldeye Cool will switch to the lowest defined set-point at -20 °C.

The temperature setpoints

The Goldeye temperature control allows to switch between setpoints automatically or manually. If set to **Auto**, it switches up or down to the next setpoint, based on the conditions inside the camera.

- **Switch to a higher setpoint:**
  If the Goldeye temperature control is no longer able to keep the sensor temperature at the current setpoint, the camera switches up to the next setpoint. An appropriate set of non-uniformity correction data is applied.
- **Switch to the lower setpoint:**
  The camera switches down by one setpoint if the camera housing temperature allows to stabilize the sensor temperature at the lower point.
- **Switch the sensor off:**
  If the internal camera temperature exceeds a preset alert limit, the camera's overheat protection circuit powers down the sensor and **Alert** state is indicated by red color of the temperature status LED.

To control and regulate the internal camera temperature, several temperature sensors are placed within the camera.

Tip **Only the sensor board is switched off**

If the internal temperature exceeds the **Alert** limit, only the sensor board is shut down. The cameras power supply is not switched off.

Temperature setpoint settling time

If the setpoint of the sensor temperature controller is changed, it takes approx. half a minute until the desired temperature is reached. During this period, the image quality may be reduced to some degree.

Operational statuses

Advice **Use an efficient heat removal device**

If the camera has switched to **Alert** status, it is also recommended to provide a more efficient heat sink for the camera housing before resuming operation.

However, additional heat dissipation arrangements are always advantageous.

LED color and flashing pattern	Status
Off	**Off**
The TEC is switched off.	
 Green-red (flashing)	**Deviated**
The sensor cooler is operating, the defined sensor temperature (setpoint) has not been reached or stabilized yet. This signal is no error signal.	
Green (continuous)	**Stable**
The temperature is stabilized at one setpoint, the camera operates optimally.	
 Red (flashing)	**UpperLimit**
The sensor cooler operates at its upper power limit. The cooler is not able to keep the set temperature; however, a critical temperature level has not been reached yet. Under warm ambient temperatures, consider red flashing for an extended period of time as a warning signal: if the camera keeps working under unchanged conditions, an emergency shutdown is likely. The image correction quality may also deteriorate during this stage.	
 Red (flashing)	**LowerLimit**
The sensor cooler operates below its lower power limit. Under cold ambient conditions, the cooler may not be required to keep the sensor temperature at the lowest setpoint. The image correction quality may also deteriorate during this stage.	
Red (continuous)	**Alert**
If the operating temperature is out of range, this may cause an emergency shutdown. An emergency shutdown is indicated by the LED continuously glowing red. In this case, the color of the LED does not change, even if the camera cools down again. If the internal camera temperature exceeds the defined threshold temperature, the sensor and the critical electronics of the sensor board shut down to prevent overheating. In this case, the camera can be restarted only manually, which is possible only after the camera cooled down sufficiently.	

Table 32: Temperature Status LED

Table 33 below describes the features to control the temperature and the functionality associated with them.

DeviceControl		
Category for temperature control		
SensorTemperatureControlMode		
Type:	Enum	If set to **TemperatureControl**, sensor temperature is stabilized to the given setpoint(s).
Access:	R/W	
Unit:		
Visibility:		
Values:	**Off, TemperatureControl**	
SensorTemperatureSetpointMode		
Type:	Enum	Activates the currently selected **SensorTemperatureSetpoint**.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Manual** **Auto**	
SensorTemperatureSetpointActive		
Type:	Enum	Displays the active setpoint.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	**1**, **2**, **3** (G-032 Cool) **1**, **2**, **3**, **4** (G-032, G-033)	
SensorTemperatureSetpointSelector		
Type:	Enum	Selects the setpoint to be activated.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**1**, **2**, **3** (G-032 Cool) **1**, **2**, **3**, **4** (G-032,G-033)	

Table 33: GenICam features for temperature control

DeviceControl		
Category for temperature control		
SensorTemperatureSetpointActivate		
Type:	Command	Activates the currently selected **SensorTemperatureSetpointSelector.**
Access:		
Unit:		
Visibility:	Beginner	
Values:		
SensorTemperatureSetpointValue		
Type:	Float	FPA temperature value, depends on **SensorTemperatureSetpointSelector.**
Access:	R	
Unit:	°C	
Visibility:	Beginner	
Values:	**Measured**/Calculated value	
DeviceTemperatureSelector		
Type:	Enum	Selects the location of temperature measurement points within the camera.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Sensor** **Sensorboard** **Mainboard**	
DeviceTemperature		
Type:	Float	Device temperature, measured at the location selected by **DeviceTemperatureSelector.**
Access:	R	
Unit:	°C	
Visibility:	Beginner	
Values:		
DeviceRelativeHumiditySelector		
Type:	Enum	Selector used for determination of the relative humidity.
Access:	R/W	
Unit:		
Visibility:	Beginner	
Values:	**Sensorboard**	

Table 33: GenICam features for temperature control (continued)

DeviceControl		
Category for temperature control		
DeviceRelativeHumidity		
Type:	Float	Relative humidity inside the camera.
Access:	R	
Unit:	%	
Visibility:	Beginner	
Values:	[Measured value]	
SensorCoolingPower		
Type:	Float	Calculated cooling power consumption.
Access:	R	
Unit:	mW	
Visibility:		
Values:		
SensorTemperatureControlState		
Type:	Enum	Status of the sensor temperature control, indicated by the temperature status LED. The sensor temperature control state is displayed by the temperature status LED. Refer to Table 32 on page 102 for detailed information.
Access:	R	
Unit:		
Visibility:	Beginner	
Values:	**Off**, **Deviated**, **Stable**, **Lower-Limit**, **Upper-Limit**, **Alert**	

Table 33: GenICam features for temperature control (continued)

Appendix

This chapter includes:

- Information about updating the firmware of Goldeye SWIR cameras
- Instructions on camera cleaning.

Firmware update

Allied Vision provides an application for Goldeye cameras that loads firmware to the camera via the GigE connection, using a simple interface. New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and carry out a firmware update if necessary.

www **More information on GigE firmware updates:**

For detailed information on GigE firmware updates download the *GigE Firmware Update* AppNote from the Allied Vision knowledge base web page:

http://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Tip **Obtaining the latest firmware version**

The firmware for Goldeye G cameras is subject to export limitations. Thus, it is not available via public download.

To update the firmware of your Goldeye G or Goldeye G Cool camera, turn to the **Allied Vision support** team.

- http://www.alliedvision.com/en/contact.html

If you are a registered customer you may also contact **Allied Vision support** via e-mail:

- support@alliedvisiontec.com

Camera cleaning

Notice **Read these instructions first.**

Please read these instructions **before** you contact your Allied Vision camera distributor for assistance.

Ask your Allied Vision camera distributor if you are not familiar with the procedures described below.

Notice **Flammable liquids.**

The cleaning liquids appropriate for camera cleaning are highly flammable.

- Always **ensure proper ventilation** when working with these liquids. Avoid accumulation of dangerous fumes.
- Always observe the applicable **accident prevention regulations.**
- Always **allow the camera to completely cool down** to room temperature before attempting any cleaning. Unplug any camera connections.

Notice **Dangerous fumes.**

Inhaling dangerous fumes may harm your health.

Always ensure proper ventilation when working with these liquids.

Pay attention to the safety instruction of the cleaning liquids.

Notice **Warranty precautions.**

To ensure your warranty remains in effect, observe the following points:

- Do not open the camera housing.
- Follow the cleaning instructions described in this chapter.
- Use only recommended cleaning material.
- When using compressed air, pay close attention to the directions given in this chapter.

Your warranty is void if any physical damage to the sensor/filter/protection glass or lenses is caused by improper cleaning attempts. This includes scratches on the surface.

Use utmost care when cleaning optical components.

Notice **Clean optical surfaces only.**

Never attempt to remove any solid or fluid substances that penetrated into the camera body.

Should that happen, always contact your distributor.

Avoiding the necessity of camera cleaning

The best way to ensure the camera remains clean is to avoid penetration of foreign substances into the camera.

When mounting or dismounting a camera lens or dust cap, always hold the camera with the mount opening pointing downwards. This minimizes the possibility of any contaminants falling on the glass surface.

Always store cameras and lenses with dust caps on.

Figure 27: Illustration of camera orientation when removing lens or dust cap

Identifying contaminations

If small visible dust or contamination particles on glass surfaces can be observed from the outside, this does not necessarily mean that these particles affect the functioning and/or application of the camera.

Since these particles are out of focus, they are not likely to have any impact on the image. An impact on the image may only be given if any particles can be observed in the video preview of your camera.

The contaminations you observe in the video preview may be situated either on the lens, on the filter/protection glass, or on the sensor. Contaminations may develop due to handling or unclean environments, even if your camera has been cleaned prior to sealing and shipment.

As shown in figure 28, contamination (dust, particles, or fluids) on the sensor or on optical components may appear as a dark area, patch, or spot on the image and remain fixed in the preview window while you rotate the camera over the target.

Also, contaminations that are situated on the edge of the lens and/or the filter, may not be in the field of view, and therefore won't be visible in the image.

Figure 28: Examples for the appearance of dust on the filter (left and middle), and the sensor (right)

Do not confuse a contamination with a pixel defect, which appears as a distinct point. Particles can either rest loosely or can be more or less stuck to the optical surface.

Where is the contamination? — Locating contaminations

Before dismounting the lens you should determine whether the contamination is situated on the filter, lens, or sensor. To do so, capture a uniform image (e.g., a white sheet of paper) with the camera. The affected optical surface is identified when optical component in question is moved (rotated) and the dirt follows this movement.

1. If you rotate only the lens (not the camera) and the contamination moves as well, the contamination is on the lens.
2. If you move the filter or protection glass window and the contamination moves as well, the contamination is on the filter or protection glass.
3. If the contamination is neither on the lens nor the filter or protection glass, it is probably on the sensor.

Removing filter / protection glass

Notice **Take special care when removing the filter or protection.**

- Removing the filter from the camera requires special care.
- If a special mounting tool is required, you must use this tool. Do not use any makeshift tool.
- Ask your distributor for assistance if you are not confident with the procedure.
- Never touch optical surfaces with bare hands

Notice **Many cameras are not fitted with a protection glass.**

Removing the lens or dust cap on these cameras immediately expose the sensor.

Always ensure that you are not inadvertently damaging the sensor surface.

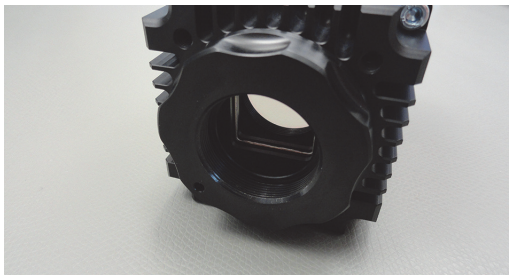


Figure 29: Camera mount without filter, directly exposing the sensor.

Cleaning instructions

Notice **Use proper cleaning materials when cleaning glass surfaces.**

- **Never** wipe lenses with dry swabs or tissue - this may cause scratches.
- As a cleaning tool, **use only** lens cleaning tabs or a lens cleaning tissue wrapped around a small piece of plastic. The lens cleaning tissue must be chemically pure and free from silicones and other additives.
- **Do not use** metal tools.
- **Do not use** any disposable cotton cosmetic swabs; they may contain contaminants.
- **Do not use** cosmetic cotton.
- **Do not use** consumer eyeglass cleaning cloths pretreated with silicone.
- **Do not use** fibrous material that may get caught in small gaps.
- As cleaning liquid, **use only** optics cleaner (60% ethyl alcohol, 40% ether) or isopropyl alcohol.

  Never use aggressive cleaners like benzine or spirits. Using cleaners like that may damage the surface.

Carry out all cleaning operations (on lenses, filter or protection glass, and sensor) in a **clean dust-free room**. The optical components are very fragile, therefore you must not touch them with your fingers or any hard material.

1. Unplug the camera from any power supply before cleaning.
2. Have the cleaning materials ready before you start the cleaning.

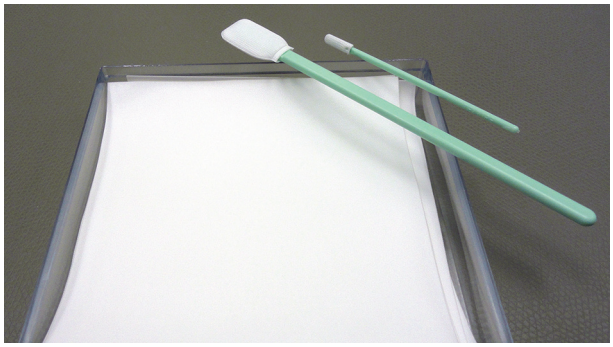


Figure 30: Lens cleaning tissues and cleaning pads.

3. Apply a small amount of cleaning liquid to a clean, new lens cleaning pad or tissue.

   The pad or tissue should be moist, not dripping. Hold the camera away from your body to avoid that particles like skin flakes fall onto the sensor. The camera front should point roughly 45 degrees upwards.
4. Wipe the glass surface in either one of two ways described below to ensure any dirt present on the surface be moved to the edge of the surface:
   - With a spiral motion from the center to the rim. Normally, several spiral wipes are recommended. Wipe only on glass avoiding contact to metal surfaces, because microscopic dirt could be released and could cause scratches on the glass.
   - With a straight motion across the glass surface from one end to the opposite end.
5. When you've finished cleaning, examine the surface in a strong light. Take an out-of-focus picture of a flat, illuminated surface to see if any dirt or dust remains.
6. If dust spots remain, repeat this procedure once, using new clean lens tissue (as described above).

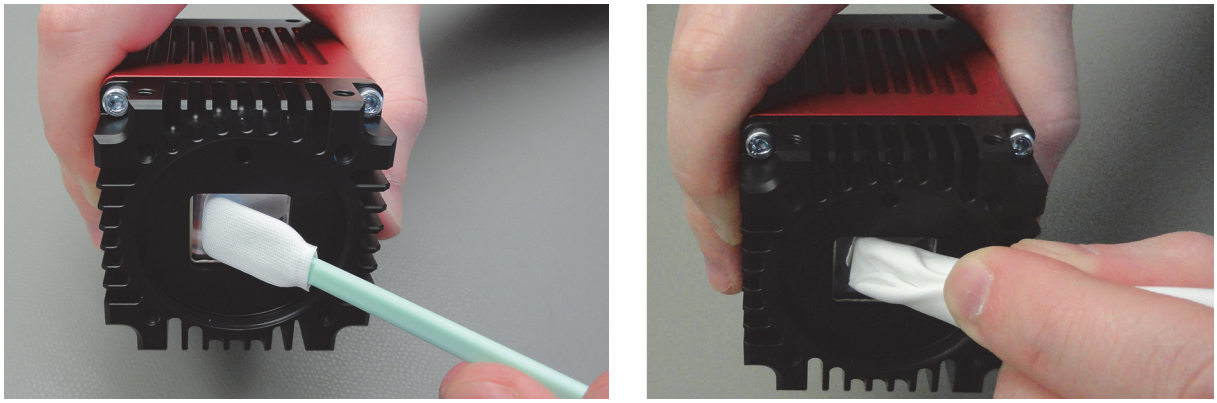


Figure 31: Use of cleaning tab or tissue to clean a sensor.

Tip

If dust spots remain:

If dust spots remain after cleaning twice, contact your Allied Vision distributor.

Use of compressed air

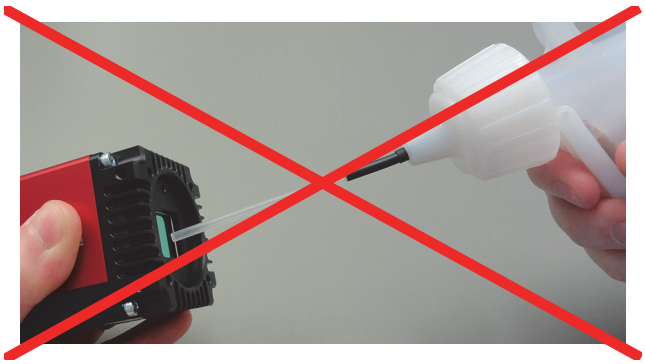


Figure 32: How **Not** to use compressed air

Notice **Dangers when using compressed air.**

As a general precaution, you should never use compressed air to clean a camera.

If you want to use compressed air in spite of all warnings, consider the following:

- Use an air blower / compressed air only if you are familiar with cleaning a camera with this instrument.
- Compressed air may blow dust into cameras and lenses.
- High pressure air may crack the sensor or glass you want to clean.

  Therefore, keep the pressure at a moderate strength only:
  - The pressure at the tube should be less than 1 bar (15 psi)
  - Operating distance: 5–30 cm
- The pressurized air must be dust-filtered and oil-free.
- Use ionized air only to avoid any static charge.
- Also, using ionized air helps to remove any dirt stuck to the optical component because of static electricity.

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