Allied Vision

5GigE Vision Cameras

Goldeye Pro G5

User Guide

V1.2.2

FW 00.03.00.361abc93

Note: Lenses are not part of this product.

Allied Vision Technologies GmbH // Taschenweg 2a, 07646 Stadtroda, Germany

2026-Jan-14

Quick links

- Goldeye Pro G5 cameras at a glance on page 15
- Contact us on page 17
- Contents on page 18

Read before use

EN - English

Safety

Before using the camera, read these safety instructions. Observe the warnings at all times. Use the camera only as stated in the Intended use on page 32.

WARNING

This product can expose you to chemicals including Carbon Black and Lead Acetate, which is known to the State of California to cause cancer. For more information go to: www.P65Warnings.ca.gov.

CAUTION

Risk of burns

A camera in operation can reach temperature levels which could cause burns.

CAUTION

Injury by falling cameras or lenses

A falling camera or lens can cause injury.

CAUTION

Risk of cuts by sharp edges of lens mounts

The threads of the lens mount can have sharp edges.

Intended use

Intended use of Allied Vision product is the integration into vision systems by professionals. All Allied Vision product is sold in a B2B setting.

DA - Dansk

Sikkerhed

Læs sikkerhedsanvisningerne, før kameraet bruges. Overhold alle advarsler. Brug kun kameraet som anført i Intended use på side 32.

FORSIGTIG

Forbrændingsfare

Når kameraet bruges, kan det blive meget varmt og forårsage forbrændinger.

FORSIGTIG

Kvæstelser, hvis kameraet eller linser falder ned

Falder kameraet eller linsen ned, kan dette forårsage kvæstelser.

FORSIGTIG

Fare for snitsår på linsemodulets skarpe kanter

Linsemodulets gevind kan have skarpe kanter.

Tilsigtet brug

Allied Vision produktets tilsigtede brug er en indbygning i et visionssystem, udført af fagfolk. Alle Allied Vision produkter sælges i B2B.

DE - Deutsch

Sicherheit

Bevor Sie die Kamera benutzen, lesen Sie diese Sicherheitshinweise. Beachten Sie diese Hinweise immer. Verwenden Sie die Kamera nur wie beschrieben in Intended use auf Seite 32.

VORSICHT

Gefahr von Verbrennungen

Im Betrieb kann die Kamera Temperaturen erreichen, die zu Verbrennungen führen.

VORSICHT

Verletzung durch fallende Kameras oder Objektive

Eine fallende Kamera oder ein fallendes Objektiv kann Verletzungen verursachen.

VORSICHT

Schnitte durch scharfkantige Objektivgewinde

Objektivgewinde können scharfe Kanten haben.

Bestimmungsgemäßer Gebrauch

Allied Vision Produkte sind bestimmt für die Integration in Bildverarbeitungs-systeme durch Fachpersonal. Alle Allied Vision Produkte werden in einer B2B-Umgebung verkauft.

ES - Español

Seguridad

Antes de utilizar la cámara lea estas instrucciones de seguridad. Observe las advertencias en todo momento. Utilice la cámara solo tal y como se estipula en el Intended use en la página 32.

ADVERTENCIA

Este producto puede exponerle a sustancias químicas, como el carbono negro (Carbon Black) y acelato de plomo (Lead Acetate), que el Estado de California considera cancerígenas. Más información disponible en: www.P65Warnings.ca.gov

ATENCIÓN

Riesgo de quemaduras

Una cámara en funcionamiento puede alcanzar temperaturas que podrían provocar quemaduras.

ATENCIÓN

Lesiones en caso de que las cámaras o las lentes se caigan

Si una cámara o una lente se cae puede provocar lesiones.

ATENCIÓN

Riesgo de cortes debido a los bordes afilados del objetivo

Las roscas de los objetivos pueden tener bordes afilados.

Uso previsto

El uso previsto del producto Allied Vision es la integración en el sistema de visión por parte de profesionales. Todos los productos Allied Vision se venden dentro de una relación B2B.

FI - Suomi

Turvallisuus

Lue nämä turvallisuusohjeet ennen kameran käyttöä. Noudata varoituksia joka hetki. Käytä kameraa ainoastaan kohdassa Intended use sivulla 32 kuvatulla tavalla.

HUOMIO

Palovammojen vaara

Käytössä olevan kameran saavuttamat lämpötilatasot voivat aiheuttaa palovammoja.

HUOMIO

Putoavien kameroiden tai linssien aiheuttamat vammat

Putoava kamera tai linssi voi aiheuttaa vammoja.

HUOMIO

Linssien kiinnikkeiden terävien reunojen aiheuttamien viiltovammojen vaara

Linssin kiinnikkeiden kierteiden reunat voivat olla teräviä.

Käyttötarkoitus

Allied Vision-tuotteen käyttötarkoitus on integrointi kuvajärjestelmiin ammattilaisten toimesta. Kaikki Allied Vision-tuotteet myydään B2B-ympäristössä.

FR - Français

Sécurité

Veuillez lire ces consignes de sécurité avant d'utiliser la caméra. Respectez continuellement les avertissements. Utilisez la caméra uniquement comme indiqué sous Intended use, page 32.

ATTENTION

Risque de brûlures

Une caméra en service peut atteindre des niveaux de température susceptibles d'entraîner des brûlures.

ATTENTION

Blessures en cas de chute de caméras ou d'objectifs

La chute d'une caméra ou d'un objectif peut entraîner des blessures.

ATTENTION

Risque de coupures sur les bords tranchants des montures d'objectif

Les filetages des montures d'objectif peuvent présenter des bords tranchants.

Utilisation prévue

L'utilisation prévue du produit Allied Vision est son intégration dans des systèmes de vision par le soin de professionnels. Tout produit Allied Vision est vendu dans un cadre B2B.

עברית - HE

בטיחות

לפני השימוש במצלמה, עליך לקרוא את הוראות הבטיחות האלו. יש לפעול על פי הוראות ביטחון אלו תמיד.
השימוש במצלמה הוא רק לפי מה שכתוב ב"השימוש המיועד"(Intended use) בעמוד 32.

זהירות

סכנת כוויה

מצלמה בפעולה עשויה להגיע לטמפרטורות גבוהות שעלולות לגרום לכוויות.

זהירות

פציעה מנפילת מצלמות או עדשות

מצלמה או עדשה שנופלות עלולות לגרום לפציעה.

זהירות

סכנה להפצע מקצוות חדים

למוצר יכולים להיות קצוות חדים.

שימוש מיועד

מוצרי AlliedVision מיועדים לשילוב במערכות ממוחשבת לעיבוד צילומים ע"י אנשי מקצוע.
כל מוצרי AlliedVision נמכרים לשימוש בסביבת B2B.

IT - Italiano

Sicurezza

Leggere queste istruzioni per la sicurezza prima di utilizzare la telecamera. Osservare sempre tutte le avvertenze. Utilizzare la telecamera come descritto alla sezione Intended use a pagina 32.

ATTENZIONE

Pericolo di ustioni

Durante il funzionamento una telecamera può raggiungere temperature elevate che possono essere causa di ustioni.

ATTENZIONE

Lesioni dovute alla caduta di telecamere o lenti

La caduta di una telecamera o di una lente può causare delle lesioni.

ATTENZIONE

Pericolo di tagliarsi sui bordi affilati degli attacchi della lente

I bordi della filettatura dell'attacco della lente possono essere affilati.

Uso previsto

Il prodotto Allied Vision è concepito per essere integrato in sistemi di monitoraggio in campo professionale. Tutti i prodotti Allied Vision sono venduti in uno scenario B2B.

JA – 日本語

安全性

本カメラを使用する前に、この安全の手引きをお読みください。常に、警告事項を守ってください。必ず、Intended use 32 ページの通りに、本カメラを使用してください。

注意

やけどの危険性

作動中のカメラは、やけどを引き起こす温度まで熱くなる恐れがあります。

注意

カメラまたはレンズの落下によるけが

カメラまたはレンズが落下すると、けがをする恐れがあります。

注意

レンズマウントの鋭利な端部で切り傷の危険性

レンズマウントのギザギザの部分が鋭利である可能性があります。

用途

Allied Vision製品は、専門家が視覚装置に統合することを意図したものです。すべてのAllied Vision製品は、企業間取り引き用に販売されています。

NL - Nederlands

Veiligheid

Lees deze veiligheidsinstructies voordat u de camera gaat gebruiken. Neem deze waarschuwingen altijd in acht. Gebruik de camera uitsluitend, zoals aangegeven in het Intended use op pagina 32.

VOORZICHTIG

Risico van verbranding

Een camera die gebruikt wordt, kan temperatuurwaarden bereiken die brandwonden kunnen veroorzaken.

VOORZICHTIG

Letsel door vallende camera's of lenzen

Een vallende camera of lens kan letsel veroorzaken.

VOORZICHTIG

Risico van snijwonden door scherpe randen van lensbevestigingen

Het schroefdraad van de lensbevestiging kan scherpe randen hebben.

Beoogd gebruik

Het beoogde gebruik van het Allied Vision-product is de integratie in optische systemen door professionals. Alle Allied Vision-producten worden verkocht in de B2B-markt.

NO - Norsk

Sikkerhet

Les disse sikkerhetsinstruksene før du bruker kameraet. Følg advarslene til en hver tid. Bruk kun kameraet i samsvar med Intended use på side 32.

FORSIKTIG

Risiko for brannskader

Et kamera i bruk kan nå temperaturnivåer som kan forårsake brannskader.

FORSIKTIG

Skade ved fallende kameraer eller linser

Et fallende kamera eller en fallende linse kan forårsake skade.

FORSIKTIG

Risiko for kutt fra skarpe kanter på linsefester

Sporene på linsefestet kan ha skarpe kanter.

Tiltenkt bruk

Den tiltenkte bruken av Allied Vision-produktet er integrering i visjonssystemer av profesjonelle. Alle Allied Vision-produkter selges i en forretning til forretning-situasjon.

SV - Svenska

Säkerhet

Läs igenom säkerhetsinstruktionerna innan du använder kameran. Var hela tiden särskilt uppmärksam på varningarna. Använd enbart kameran på det sätt som anges i Intended use på sida 32.

VARNING

Risk för brännskada

En kamera i drift kan komma upp i temperaturer som kan orsaka brännskador.

VARNING

Risk för skador från fallande kameror eller objektiv

Fallande kameror eller objektiv kan förorsaka skador.

VARNING

Risk för skärsår från vassa kanter på objektivfattningar

Objektivets gängor kan ha vassa kanter.

Avsedd användning

Den avsedda användningen av Allied Vision-produkter är integrering i visionssystem av fackmän. Samtliga Allied Vision-produkter säljs i en B2B-miljö.

ZH - 简体中文版

安全需知

使用本相机前，请阅读本安全说明书。请务必遵守相关警告 和 Intended use 于第 32 页 .

注意事项

烫伤风险

相机操作过程中温度可能上升并导致烫伤风险。

注意事项

相机或者镜头跌落造成伤害

相机或者镜头可能会跌落并造成伤害。

注意事项

镜头接口的锐利边缘划伤风险

镜头接口螺纹边缘可能较为锐利。

预期用途

Allied Vision 产品的预期用途是由专业人士整合到视觉系统中。所有 Allied Vision 的产品均通过 B2B 渠道销售。

Goldeye Pro G5 cameras at a glance

Get an overview of Goldeye Pro G5 documentation:

Consider for Goldeye Pro G5 cameras

For a smooth product experience, we suggest you to observe:

Topic	Details
Camera startup time	The typical boot sequence for Goldeye Pro G5 cameras takes up to 2 minutes. Correction datasets that are being loaded on camera startup can extend the startup time.
Camera installation	100MBit mode known from Goldeye G is not supported. Goldeye Pro G5 cameras require **different hardware and settings** than 1000BASE-T cameras like Goldeye G and Mako cameras. We suggest you to: • Build up general knowledge: Tips and tricks to connect 5GBASE-T on page 127. • Set up a quick running test: Installing the camera on page 76. • Find solutions for issues: Troubleshooting common issues on page 136.
Switches	We recommend you to avoid using switches with Goldeye Pro G5 cameras, if not required by the application. Better use a separate NIC per camera.

Shipping contents

- Goldeye Pro G5 camera
- Download Instructions for First Camera Operation document

What else do you need?

This is a selection of helpful downloads:

Download	Link
Goldeye Pro Features Reference	www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation
Modular Concept	
STEP files	
Vimba X SDK for Windows, Linux, and Linux/ARM, including **Vimba X Viewer**, **Firmware Updater**, and **Driver Installer** for Windows	www.alliedvision.com/en/products/software/vimba-x-sdk
Firmware downloads	www.alliedvision.com/en/support/firmware-downloads
Accessories, such as interface cables and cards, power and I/O cables, power supplies, heat sinks, and lenses	www.alliedvision.com/en/products/accessories

Table 1: Downloads for Goldeye Pro G5 cameras

Contact us

Website, email

General
www.alliedvision.com/en/contact
info@alliedvision.com

Distribution partners
www.alliedvision.com/en/avt-locations/avt-distributors

Support
www.alliedvision.com/en/support
www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma

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Contents

Document history and conventions

This chapter includes:

Document history

Version	Date	Remarks
V1.2.2	2026-Jan-14	**Firmware version**: 00.03.00.361abc93 • Removed obsolete footnote from tables for operating conditions in Goldeye Pro G5 model specifications on page 47. • Updatedvalues for trigger jitter in Table 64: Trigger timings for Goldeye Pro G5 on page 113.
V1.2.1	2025-Dec-16	**Firmware version**: 00.03.00.361abc93 • Added contents for 8-bit sensor readout mode in Sensor ADC readout modes for maximum frame rates on page 45. • Updated tables for EMVA 12288 measurements in Goldeye Pro G5 model specifications on page 47. • Changes in Goldeye Pro G5-130 VSWIR TEC1 on page 47: - Added 8-bit sensor readout mode and updated the maximum frame rate value in the specifications table. - Added 8-bit values for ROI frame rates. • Applied editorial changes.

Table 2: Document history (sheet 1 of 3)

Version	Date	Remarks
V1.2.0	2025-Oct-28	**Release: Firmware version**: 00.03.00.361abc93 • Added data for Goldeye Pro G5-130 VSWIR TEC1. • Added support for multiple regions in the tables for Goldeye Pro G5 model specifications on page 47. • Changes to Goldeye Pro G5 model specifications on page 47: - Reduced the minimum operating temperature from 0 °C to -15 °C. - Updated ROI frame rates for Pro G5-320/530 VSWIR TEC1. • Added Sensor line equalization (BlackLevelEqualizationMode) to Camera feature availability on page 67. • Added auto contrast, auto exposure, contrast, digital binning, and look-up table (LUT) to Camera feature availability on page 67. • Removed the separate section on using the camera's front mounting threads in Mounting the camera on page 79. • Updated Image data flow on page 115. • Added contents for BlackLevelEqualizationMode, binning, and contrast to Image processing on page 118. • Applied editorial changes.
V1.1.0	2025-Aug-21	**Release: Firmware version**: 00.02.00.1b45a27b • Updated data for emergency shutdown temperature in the specification tables in Goldeye Pro G5 model specifications on page 47. • Added tables for LED behavior in Camera temperature status LED on page 98 and Ethernet and power status LEDs on page 110. • Added a reference to the Defect Pixel Manager for user defined DPC datasets in Defect pixel correction (DPC) on page 117. • Added data for Overtriggering on page 114. • Updated the Image data flow diagram on page 116 • Added a note about BlackLevelAutoAdjust in Black level on page 119. • Added contents for Look-up table on page 120. • Applied editorial changes.

Table 2: Document history (sheet 2 of 3)

Version	Date	Remarks
V1.0.4	2025-Jul-10	**Firmware version**: 00.01.00.10fe3bdd • Changes in Goldeye Pro G5 model specifications on page 47: - Updated the values for power consumption. - Extended the humidity range for camera operation from 20% – 80% to 10% – 95%. • Aligned the voltage unit from V to VDC. • Applied editorial changes.
V1.0.3	2025-Jun-23	**Firmware version**: 00.01.00.10fe3bdd • Aligned references to PoE to: IEEE 802.3at Type 1, Class 0. • Updated Figure 1: Camera label on page 30. • Added the safety note RCG models: Damage to the sensor on page 38. • Updated model specifications in Goldeye Pro G5 model specifications on page 47: - Added information for RCG (Removed Cover Glass) sensor options in the tables for operating conditions. - Updated the value for Signal-to-noise ratio in the tables for the imaging performance. • Added a warning message for RCG models in Temperature control on page 306.
V1.0.2	2025-Jun-19	**Release: Firmware version**: 00.01.00.10fe3bdd • Updated various contents to match series cameras. • Applied editorial changes.
V1.0.1	2025-Jan-24	**Release: Firmware version**: 0.9. • Updated various contents to match prototype cameras. • Updated the firmware version.
V1.0.0	2024-Nov-14	**Release: Firmware version**: 00.00.01.ENG Release version

Table 2: Document history (sheet 3 of 3)

Conventions used in this user guide

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

Typographic styles

Style (example)	Content
Emphasis	Programs or important things
`Feature names`	Firmware feature names
`Feature options`	Features options
UI Element	Display text output by the system, such as parts of the GUI, dialog boxes, buttons, menus, or window titles
Reference	Web links or internal cross references

Table 3: Typographic styles

Symbols and notes

Warning

Risk of injuries

Precautions are described.

CAUTION

Risk of burns

Precautions are described.

CAUTION

Injury by falling cameras or lenses

Precautions are described.

CAUTION

Risk of cuts by sharp edges of lens mounts

Precautions are described.

NOTICE

Material damage or violation of data security

Precautions are described.

Practical Tip

Additional information helps to understand or ease handling the camera.

Avoiding malfunctions

Precautions are described.

Additional information

Web link or reference to an external source with more information is shown.

Acronyms and terms

The following table provides a list of acronyms and terms used in this document.

Acronym or term	Description
ADC	Analog to Digital Converter
AIA	Automated Imaging Association
CRA	Chief ray angle
DoC	Document of Conformity for CE certification
DPC	Defect pixel correction
EMVA	European Machine Vision Association
ESD	Electrostatic Discharge
FCC	Federal Communications Commission
FOV	Field of view
fps	Frames per second
Gbit/s	Gigabit per second
GenICam	Generic Interface for Cameras, EMVA
GND	Ground
GS	Global shutter
H × V	Horizontal × Vertical (sensor resolution)
I/O lines	Input and output lines
LPS	Limited power source according to IEC 62368-1
L × W × H	Length × width × height (camera housing dimensions)
MByte	Megabyte
MByte/s	Megabyte per second

Table 4: Acronyms and terms (sheet 1 of 2)

Acronym or term	Description
N.a.	Not applicable (in tables)
NIC	Network interface card
NUC	Non-uniformity correction
PoE	Power over Ethernet
PSE	Power sourcing equipment
QE	Quantum efficiency
ROI	Region of interest
SFNC	Standard Feature Naming Convention (GenICam)
shutter type	Sensor specific readout, such as rolling shutter (RS) or global shutter (GS)
TEC	Thermo-electric cooling
UDP	User Datagram Protocol

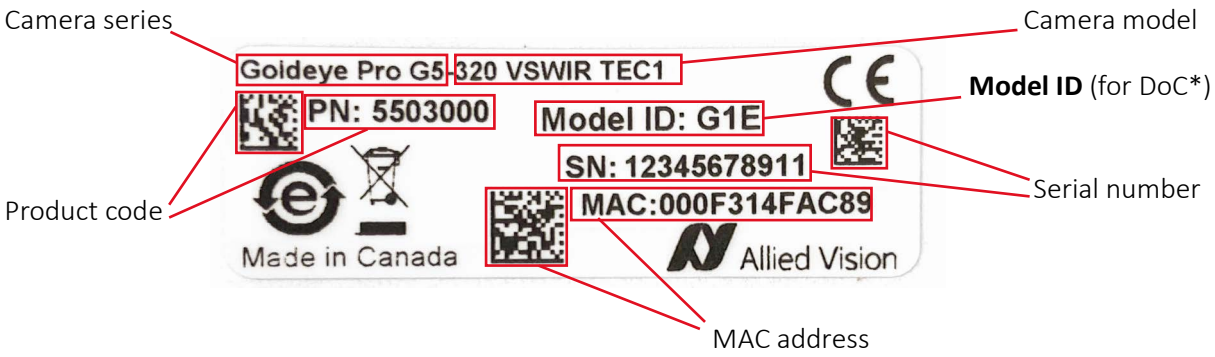
Table 4: Acronyms and terms (sheet 2 of 2)

Compliance, safety, and intended use

This chapter includes:

Camera identification

You can identify your Goldeye Pro G5 camera like this:



*Document of Conformity to enable CE certification

Figure 1: Camera label

Closed housing Goldeye Pro G5 cameras have the Model ID: **G1E**.

Compliance notifications

National regulations on disposal must be followed.

Please check with your local Sales representative for KC certified models.

For customers in the US

Class B digital device

Note: 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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference does not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, 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 separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Supplier Declaration of Conformity

Goldeye Pro G5 cameras comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Party issuing Supplier's Declaration of Conformity

Allied Vision Technologies GmbH
Taschenweg 2a
07646 Stadtroda, Germany
T// +49 (36428) 677-106
quality@alliedvision.com

Responsible party - US contact information

Allied Vision Technologies, Inc.
102 Pickering Way – Suite 502
Exton, PA 19341, USA
T// +1 978 225 2030

Note: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For customers in Canada

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

CAN ICES-3 (B) / NMB-3 (B)

Pour utilisateurs au Canada

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

CAN ICES-3 (B) / NMB-3 (B)

Avoid electromagnetic interferences

Interface cables, power cables, and I/O cables are sensitive to electromagnetic interference.

- Use shielded cables only.
- We recommend using cables offered by Allied Vision.
- Avoid coiling.
- We recommend using I/O lines only in environments with low electromagnetic interference.

Moreover, avoid unnecessary bending to prevent damage to the cables.

Intended use

Allied Vision's objective is the development, design, production, maintenance, servicing and distribution of digital cameras and components for image processing. We are offering standard products as well as customized solutions.

Intended use of Allied Vision product is the integration into Vision systems by professionals. All Allied Vision product is sold in a B2B setting.

Unless expressly agreed otherwise, we design, manufacture, and supply in accordance with the standards of the machine vision industry.

In the event of requirements going beyond this, the customer must:

- Notify us of the special use for each model before the first order is placed so that the models in question can be separated out from the standard processes using their own part numbers, and
- Conclude a quality assurance agreement with us prior to purchasing, to define its requirements in a legally secure manner.

This may require a surcharge, as our prices are very tightly tailored to standard requirements.

Copyright and trademarks

Your safety

This section informs about issues related to your personal safety. Descriptions explain how to avoid hazards and operate Goldeye Pro G5 cameras safely.

Handling lens mounts

The lens mount thread has sharp edges. Be careful these edges do not cut your skin when mounting or unmounting lenses.

Handling hot cameras

Depending on the individual setup, Goldeye Pro G5 cameras may exceed the specified maximum operating temperature. In many cases, mounting the camera on a metal surface or using heat sinks will be sufficient to cool the camera effectively.

If you have doubts or questions, please feel free to contact your Allied Vision Sales representative for support!

If the sensor temperature exceeds the specified **Alert** value, the camera is switched off automatically. Afterwards, a power cycle is needed to restart the camera.

The current values for the temperature of the mainboard, sensor, or sensor board are output by `DeviceTemperature`. You can use this value to control cooling by software, for example, to control a fan.

However, if you hold the camera in your hands during operation, your skin may get hurt. If you touch the camera when it is heated up, we recommend wearing protective gloves.

Providing optimum heat dissipation

Operation outside the allowed temperature range can damage the camera. For best performance and to protect the camera from damage, keep the housing temperature in the specified operating temperature range.

Observe the following:

- To avoid camera overtemperature shutdown, operate the camera with a lens or lens adapter attached only.
- For maximum heat dissipation, affix the camera to a heat sink, using the mounting holes.
- Use mounting base and heat sink with large surface areas.
- Use a mounting base with a high thermal conductivity.
- Reduce ambient temperature. For example, in an outdoor application with direct sunlight, provide shading by an enclosure.
- Provide ventilation or other active cooling of camera, mounting base, and heat sink.

Goldeye heat sink kit

We recommend using the 1068300 Heat Sink Kit for Goldeye Pro G5 and Goldeye G/CL. The set consists of one heat sink, thermal interface pad, fixtures, and mounting tool. Up to four heat sinks can be fitted to one camera.

Heat sink kit

For more information, see the Goldeye G/CL, Goldeye Pro G5 Heat Sink Kit User Guide at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Camera mounting

Cameras must be mounted using the mounting threads. If vibration is higher than specified, cameras can disconnect from the mounting. Falling cameras can hurt you. To avoid personal injury:

- Mount the camera according to the instructions in Mounting the camera on page 79.
- Ensure, shock and vibration do not exceed the specified range, see Shock and vibration on page 41.
- For heavy or long lenses, use a lens support and apply tests.

How to avoid product damage

To prevent material damage, read the following and understand how to safely handle and operate the camera. Get helpful details about electrical connections and learn how to optimize camera performance.

Electrical connections

ESD

Follow these instructions to avoid damage to Goldeye Pro G5 cameras, including possible **damage to the sensor**, see Possible damage to image sensors due to electrostatic charge on page 37. ESD is dangerous for electronic devices, especially when tools or hands get in contact with connectors and electronic components. We recommend you to take suitable measures to avoid damage by ESD.

Cable connections

Provide sufficient strain relief for all cable connections to avoid short circuits and malfunctions. For all cable connections, use only shielded cables to avoid electromagnetic interference.

Camera power

Operating the camera beyond the specified range damages the camera.

Cameras can be powered using the I/O connector at an input range of 12 VDC to 24 VDC (±10%), using a limited power source (LPS), according to IEC 62368-1 with maximum 2.0 A. The camera is not intended to be connected to a DC distribution network.

Alternatively, cameras can be powered over Ethernet. However, power consumption and heat generation are higher than with external power, using the I/O connector.

- Make sure that PoE power sourcing equipment is at least compliant to IEEE 802.3at Type 1, Class 0.
- Only use power supplies that meet the insulation requirement according to PELV or SELV. For details, please refer to IEC 61140.
- If using external power supplies by third-party manufacturers, observe polarity to avoid damage to the camera electronics.

PoE versus external power

Powering the camera via PoE results in higher power consumption and heat generation than external power, resulting in higher energy costs and requiring more efficient heat dissipation.

External power supply

For a suitable external power supply, see www.alliedvision.com/en/products/accessories.

PoE Power Sourcing Equipment (PSE)

Damage to the camera or connected peripherals can occur if PSE is not galvanically isolated from mains and other electrical connections towards the camera (other than Ethernet signals and shield ground).

To avoid damage

- Only use IEEE 802.3at Type 1, Class 0 compliant PSE equipment to power the camera via PoE.
- Ensure the PSE is galvanically isolated from mains and all other electrical connections towards the camera.

I/Os

To avoid damage to the camera, keep the maximum values for

- Isolated I/Os: Input voltage at or below 24 VDC, output current below 20 mA per output.
- Non-isolated I/Os: Input voltage at or below 5.5 VDC, output current below 20 mA per output.

See I/O connector pin assignment on page 103 for details. The maximum length for I/O cables must not exceed 30 meters.

Power supply via I/O cables

If you power the camera via an I/O cable, consider the voltage drop to meet the minimum supply voltage for the camera.

5GBASE-T connection

5GBASE-T NICs

To avoid damage to 5GBASE-T NICs and injectors, make sure that PoE power sourcing equipment is at least compliant to IEEE 802.3at Type 1, Class 0.

5GBASE-T accessories

For accessories, such as interface cables and cards, see www.alliedvision.com/en/support/accessory-documentation.

Ethernet cables

Proper cable handling enables reliable performance:

- Use only Category 6 or higher rated cables for reliable camera operation.
- Use only shielded cables to avoid electromagnetic interferences.
- Please use cables recommended by Allied Vision.
- Avoid unnecessary bending to prevent damage to the cables.
- Avoid coiling to prevent electromagnetic interference.

Optical components

Provide the following conditions to keep dirt and droplets out of the optical system of camera and lens:

- Dust-free environment
- Low relative humidity
- No condensation.

When camera or lens are stored:

- Cover the lens mount with a protection foil or cap.
- Cover front and back lens with caps.

Sensor

Sensors are sensitive to excessive radiation: focused sunlight, UV light, lasers, and X-rays can damage the sensor. Dirt and scratches can damage the sensor as well. Goldeye Pro G5 cameras do not need additional cleaning. Cameras are cleaned before shipping. Incorrect cleaning can damage the sensor or the filter. Therefore, never clean the sensor or the filter.

Protect the camera filter and the sensor from dirt, because dirt becomes more visible the closer it gets to the sensor. In addition, keep the back lens clean.

Hold the camera with the lens mount facing the ground to keep dirt out of the lens mount. When no lens is mounted, protect the sensor and filter by a dust cap.

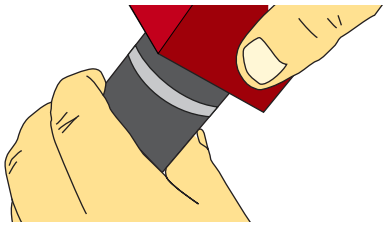


Figure 2: Holding the camera with the lens mount facing the ground

Possible damage to image sensors due to electrostatic charge

In some rare cases, electrostatic charge occurring on the surface of the image sensor may cause damages to particular pixel groups, which may become visible as bubbles or blobs in the image generated by the sensor.

Therefore, it is very important to comply with ESD protection measures in accordance with technical standards. We recommend you to take suitable measures to avoid damage by ESD.

Optical cleaning at Allied Vision

Before being shipped, each Goldeye Pro G5 is tested for cleanliness in order to meet the requirements of machine vision applications. For more information, see the Optical Cleaning for Allied Vision Cameras competence showcase document at www.alliedvision.com/de/support/faqs-application-notes.

RCG models: Damage to the sensor

Goldeye Pro G5 models are available with RCG (Removed Cover Glass) sensor option. For these models, condensation can cause short circuits on the sensor.

- During operation, avoid condensation of humidity on the sensor.
- Set the `SensorTemperatureSetpointMode` feature to ***`Manual`*** (default), avoid using ***`Auto`*** mode.
- Set all values for `SensorTemperatureSetpointValue` carefully.
- Observe the description in the Handling Cameras with RCG and TCG Options application note, see the note below:

Temperature control on RCG models

To avoid damage to the sensor, read the description in the Handling Cameras with RCG and TCG Options application note: www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Lenses

Maximum protrusion

The sensor, filter, or lens can be damaged if a lens exceeding maximum protrusion is mounted to the camera. Use lenses with a maximum protrusion within camera specifications. Figure 3 shows schematics for maximum protrusion. For details, see Dimensions, mass, and maximum protrusion on page 62.

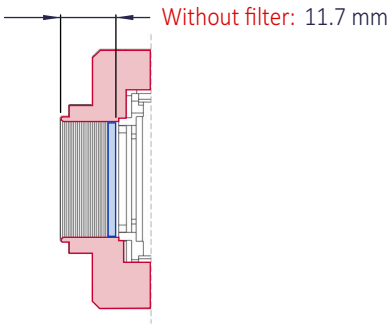


Figure 3: Maximum protrusion with C-Mount

Mechanical components

Heat sinks

Heat sinks can be used to cool the camera for safety and to improve image quality. See Goldeye heat sink kit on page 34 for a heat sink by Allied Vision. For third party products, adhere to the instructions provided by the manufacturer of the heat sink.

Conductive media

Some conductive media for heat sinks contain corrosive substances that can damage optical surfaces of the sensor, filter, and lens.

- Cover the optical path of the camera when you apply heat sink compound or adhesive to prevent substances and fumes from damaging optical surfaces.
- Adhere to the instructions and safety notes provided by the manufacturer of the conductive media.
- Ensure that the conductive media is correctly positioned: covering only the components to be cooled.

Specifications

This chapter includes:

Applied standards

GenICam

The European Machine Vision Association (EMVA) administers GenICam. GenICam establishes a common camera control interface so that third-party software can communicate with cameras from various manufacturers without customization.

Supporting various industrial camera interfaces technologies, GenICam is the framework for the GigE Vision camera control.

GigE Vision

The GigE Vision standard specifies a UDP Ethernet based protocol for machine vision and imaging products. It provides control over compliant devices by GenICam Applications Programming Interface (API). The GigE Vision standard is administered by the Automated Imaging Association (AIA).

IP class

Equipped with a lens as intended, Goldeye Pro G5 cameras comply with IP40 class according to IEC 60529.

Shock and vibration

Goldeye Pro G5 cameras were successfully tested for compliance with:

- IEC 60068-2-6, Sinusoidal vibration testing
- IEC 60068-2-27, Non-repetitive shock testing
- IEC 60068-2-27, Repetitive shock testing
- IEC 60068-2-64, Random vibration testing

Cameras were inspected before and after the tests. All tests were passed successfully:

Condition	Passed
Mechanics	• The camera housings showed no deformations. • The connections between camera components had not come loose. • The sensor position was within the specified tolerances of a new camera.
Camera behavior	Camera functionalities were not affected, no deviations occurred.
Image streaming	Images were streamed without errors.

Table 5: Conditions for passed tests

The conditions for cameras and lenses were the same for all tests. Solid aluminum tubes were used to represent real lenses:

Parameter	Value
Lens dummy length	45 mm
Lens dummy mass	140 g

Table 6: Conditions for lenses

IEC 60068-2-6: Sinusoidal vibration

Frequency	Acceleration	Displacement	Tolerances	
10 Hz	Not applicable	1.5 mm	-10%	10%
58.1 Hz	Not applicable	1.5 mm		
500 Hz	20 $g^{(1)}$	Not applicable		
[1] g = Gravity of earth				

Table 7: Frequency, acceleration, and displacement for IEC 60068-2-6 tests

Parameter	Value
Axis$^{(1)}$	x, y, z
Sweep rate	1 oct/min
Sweep duration per axis [hh:mm:ss]	03:45:40
Number of sweeps	40
[1] For technical reasons, all three axes were tested in a shaker in the upright position without a sliding table.	

Table 8: Other parameters for IEC 60068-2-6 tests

IEC 60068-2-27: Shock

Parameter	Value
Axis	x, y, z
Acceleration	50 $g^{(1)}$
Number of shocks per axis	3
Duration per axis	11 ms
Waveform	Half sine
[1] g = Gravity of earth	

Table 9: Parameters for IEC 60068-2-27 tests, non-repetitive

Parameter	Value
Axis	x, y, z
Acceleration	25 $g^{(1)}$
Number of shocks per axis	500
Duration per axis	6 ms
Waveform	Half sine
[1] g = Gravity of earth	

Table 10: Parameters for IEC 60068-2-27 tests, repetitive

IEC 60068-2-64: Random vibration

Frequency	Acceleration[(1)]
5 Hz to 500 Hz	0.05 $g^2/_{Hz}$
[1] g = Gravity of earth	

Table 11: Frequency and acceleration for IEC 60068-2-64 tests

Parameter	Value
Axis	x, y, z
Acceleration RMS (Sigma)	4.9 $g^{(1)}$
Duration per axis [hh:mm:ss]	00:30:00
[1] g = Gravity of earth	

Table 12: Other parameters for IEC 60068-2-64 tests

Notes on specifications

This section defines the conditions for specifications stated in this chapter.

Exposure time and frame rates

Parameters for frame rate values

Values for frame rates were measured, based on the following parameters:

Parameter	Maximum frame rates	ROI frame rates
Table type	Specifications by model	ROI frame rates
Resolution	Maximum	Various
Exposure time	Minimum	
Pixel format	Mono8	Various
Bit depth	Sensor ADC readout using maximum bit depth	
Operation mode	Freerun, without triggering	
Bandwidth	Bandwidth required for the corresponding frame rate, see the tables for ROI frame rates.	

`DeviceLinkThroughputLimit` was used to set the maximum bandwidth of 625 MByte/s. Observe that data overhead of the Ethernet connection and on the host are included in this value. See Factors for exposure time and frame rates below.

Deviations from stated frame rates can occur, especially when:

- The camera is operated in triggered mode
- Low bandwidth is used as adjusted by `DeviceLinkThroughputLimit` or when the host connection is limiting the throughput.
- Small ROIs are used.

Factors for exposure time and frame rates

- `DeviceLinkThroughputLimit` is a feature to control the bandwidth used by the camera. You can use this feature to configure an optimum compromise between the frame rate and the bandwidth for your application. `DeviceLinkThroughputLimit` has a default value of 625 MByte/s and is disabled by default. See Operating systems and bandwidth on page 135.
- A general formula to calculate the maximum **frame rates for arbitrary ROIs** will be added to a future version of this document. Parameters for frame rate values on page 44 defines the conditions for measuring ROI frame rates.

Sensor ADC readout modes for maximum frame rates

If you are using pixel formats that do not require 12-bit sensor ADC readout and you want to achieve higher frame rates, you can select between readout modes for 12-bit, 10-bit, and 8-bit with some Goldeye Pro G5 camera models. See your model's specifications.

By default, Goldeye Pro G5 models use the maximum bit depth for `SensorBitDepth`. For selected models, ***`Adaptive`*** mode switches automatically between 12-bit and 10-bit sensor ADC readout, depending on the selected pixel format's bit depth. This allows to reduce bandwidth and increase frame rates when only 10-bit is required.

To enable the 8-bit sensor readout mode, you must switch manually, using `SensorBitDepth`. Please observe that the image brightness changes when you switch between 8-bit sensor ADC readout mode and the other readout modes.

Keep in mind that changing the output bit depth of the sensor also affects the minimum available exposure time of the camera.

ExposureMode and effective exposure times

This section describes the influence of the `ExposureMode` setting and other effects that can impact the effective exposure time.

ExposureMode = Timed

If `ExposureMode` is set to ***`Timed`***, the value of `ExposureTime` controls the exposure. Please note that the effective exposure time may be implicitly increased: The **exposure time offset is included** in the selected exposure time.

Measure the pulse length of the ***`ExposureActive`*** signal at a general purpose output to determine the specific effective exposure time including the added parts as described above.

Achieved frame rates may not match specified values

Your individual setup may cause delays or losses in data transmission.

Bandwidth adjustments

Consider that the available bandwidth for image payload depends on your individual hardware, the operating system, software and drivers, and your application. We recommend you to adjust `DeviceLinkThroughputLimit` to the capabilities of your system.

Parameters for power consumption measurement

Values for power consumption in the specification tables are based on the following parameters:

Parameter	Maximum power consumption	Typical power consumption, without cooling
Camera settings	Factory settings (camera after power up)[1]	
Exposure time	Minimum	
TEC mode	TEC setpoint set to the lowest value for maximum cooling power	TEC disabled

[1] This includes settings for the frame rate, resolution, pixel format, bit depth, and bandwidth.

Table 13: Parameters for power consumption measurement

Dimensions and mass

For your model's dimensions, see Dimensions, mass, and maximum protrusion on page 62. For technical drawings, see Technical drawings on page 63.

Goldeye Pro G5 model specifications

Goldeye Pro G5-130 VSWIR TEC1

General

Parameter	Values
Sensor model	Sony IMX990
Resolution	1296 (H) × 1032 (V); 1.3 MP
Sensor type	InGaAs
Shutter type	Global shutter (GS)
Sensor size	Type 1/2; 6.4 mm × 5.1 mm; 8.2 mm diagonal
Pixel size	5 µm × 5 µm
CRA	0 deg
Sensor bit depth (ADC)	8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit)
Monochrome pixel formats	Mono8, Mono10, Mono10p, Mono10Packed, Mono12 (default), Mono12p, Mono12Packed, Mono14, Mono16
Maximum frame rate	135 fps
Exposure time [1]	21 µs to 114 s
Exposure modes	Timed
Analog gain	0 dB to 18 dB | Increment: 0.1 dB
Digital gain	18.1 to 42 dB | Increment: 0.1 dB
Digital binning	Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows
Multiple ROI (H × V)	*Vertical*: 1 × 1 to 1 × 8
Image buffer (RAM)	480 MByte
Non-volatile memory	~4 GByte (eMMC)[2], 32 MByte (Flash)
Inputs and outputs	See Camera interfaces on page 99.
Digital interface	5GBASE-T or 2.5GBASE-T (NBASE-T) and 1000BASE-T
Camera controls	GenICam (GenICam Access)

[1] Maximum exposure value given is valid for 0 dB and sensor temperature of +20 °C.
For exposure times above 1 s, the image quality may deteriorate, NUC and DPC are disabled.

[2] Available memory depends on the stored correction data.

Table 14: Goldeye Pro G5-130 VSWIR TEC1 general specifications

Imaging performance

Parameter	Value (0 dB gain)(1)	Value (18 dB gain)(1)
Dark current(2)	6,600 ke⁻/s	
Temporal dark noise (readout noise)	232 e⁻	195 e⁻
Signal-to-noise ratio(3)	max. 52.3 dB	max. 42.1 dB
Saturation capacity	167.7 ke⁻	16.2 ke⁻
Dynamic range	57.2 dB	38.4 dB
Pixel operability	>99.5%	

[1] Measured at 20 °C.

[2] This value strongly depends on the sensor temperature.
Without Dark Current Suppression-> `BlackLevelAutoAdjustMode` = *Off*.

3 Calculated from sensor saturation = 20 * log [SQR (Saturation capacity)].

Table 15: Goldeye Pro G5-130 VSWIR TEC1 imaging performance

Mechanics

Parameter	Values
Body dimensions (L × W × H) without lens mount adapter	78 mm × 55 mm × 55 mm
Lens mount	C-Mount
Mass, including lens mount	350 g

Table 16: Goldeye Pro G5-130 VSWIR TEC1 mechanical specifications

Operating conditions

Parameter	Values
Operating temperature	-15°C to +55 °C (housing)
Emergency shutdown temperature for TEC element[1]	+70 °C (*Sensor*)
Emergency shutdown temperature for sensor, TEC element[1]	+75 °C (*SensorBoard*)
Storage temperature	-30 °C to +70 °C (ambient)
Temperature control	Single-stage thermo-electric cooling (TEC1)
Sensor cooling temperature, setpoints[2]	• +20 °C (default and calibrated) • +5 °C, +35 °C, +50 °C (uncalibrated) • User-configurable
Relative humidity	10% to 95%, non-condensing

[1] Output by `DeviceTemperatureSelector` = *Sensor* or *SensorBoard*

[2] Even though the first temperature setpoint is pre-configured to +20 °C, it is possible to set it to other temperature values. Observe that condensation may occur if the sensor temperature is lower than the ambient temperature, especially in humid environments.
Models with RCG (Removed Cover Glass) sensor option:
+20 °C (default and calibrated), +35 °C, +50 °C (uncalibrated), user-configurable

Table 17: Goldeye Pro G5-130 VSWIR TEC1 operating conditions

NOTICE

RCG models: Damage to the sensor

Condensation can cause short circuits on the sensor.

- During operation, avoid condensation of humidity on the sensor.
- Set the `SensorTemperatureSetpointMode` feature to *Manual* (default), avoid using *Auto* mode.
- Set all values for `SensorTemperatureSetpointValue` carefully.
- Observe the description in the Handling Cameras with RCG and TCG Options application note, see the note below.

Temperature control on RCG models

To avoid damage to the sensor, read the description in the Handling Cameras with RCG and TCG Options application note: www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Power conditions

Parameter	Values
Power requirements (DC)	• 12 VDC to 24 VDC (±10%) • PoE (IEEE 802.3at Type 1, Class 0)
Maximum power consumption	• 10 W (12 VDC) • 11 W (PoE)
Typical power consumption without cooling	• 5 W (12 VDC) • 6 W (PoE)

Table 18: Goldeye Pro G5-130 VSWIR TEC1 power conditions

Absolute QE

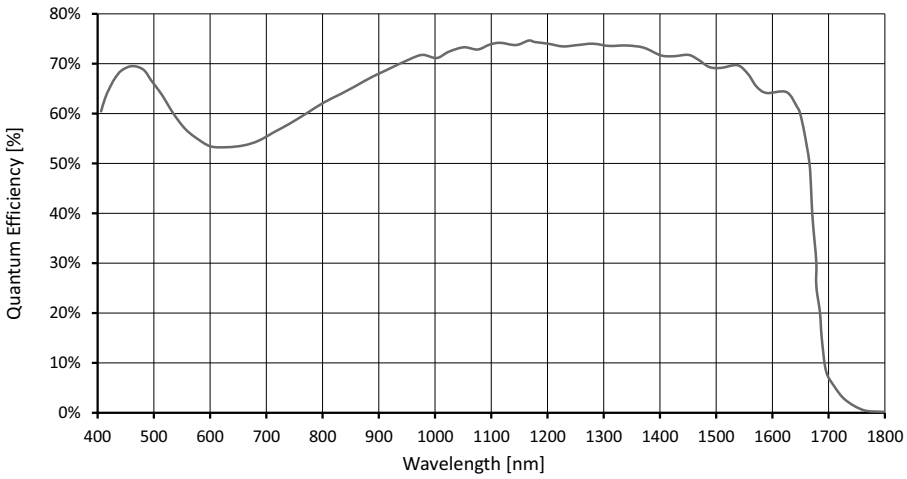


Figure 4: Goldeye Pro G5-130 SWIR TEC1 (Sony IMX990) absolute QE

ROI frame rates

Measurements were done at a bandwidth of 625 MByte/s

Image format	Width	Height	Mono8 (8-bit)[1]	Mono8 (10-bit)[1]	Mono10 (10-bit)[1]	Mono10p (10-bit)[1]	Mono12 (12-bit)[1]	Mono12p (12-bit)[1]
Full resolution	1296	1032	135.0		125.4		71.9	
SXGA	1280	1024	136.0		126.3		72.5	
HD 720	1280	720	190.7		177.1		101.6	
XGA	1024	768	179.3		166.6		95.6	
SVGA	800	600	226.7		210.6		120.8	
VGA	640	480	279.4		259.5		148.9	
HVGA	480	320	405.0		376.1		215.8	
QVGA	320	240	522.4		485.2		278.4	
HQVGA	240	160	735.8		683.1		392.0	
QQVGA	160	120	924.2		858.4		492.4	
Max. × half	1296	520 (2)	259.4		240.8		138.2	
Max. × min.	1296	8	3267.9		3039.5		1745.2	
Min. × max.	8	1032	135.0		125.4		71.9	
Min. × min.	8	8	3267.9		3039.5		1745.2	

[1] Value for `SensorBitDepth`, see Sensor ADC readout modes for maximum frame rates on page 45.

[2] Value was rounded up to the next multiple of 8.

Table 19: Goldeye Pro G5-130 VSWIR TEC1 ROI frame rates

Goldeye Pro G5-320 VSWIR TEC1

General

Parameter	Values
Sensor model	Sony IMX993
Resolution	2080(H) × 1544 (V); 3.2 MP
Sensor type	InGaAs
Shutter type	Global shutter (GS)
Sensor size	Type 1/1.8; 7.2 mm × 5.3 mm; 8.9 mm diagonal
Pixel size	3.45 µm × 3.45 µm
CRA	0 deg
Sensor bit depth (ADC)	10-bit, 12-bit; Adaptive (10-bit, 12-bit)
Monochrome pixel formats	Mono8, Mono10, Mono10p, Mono10Packed, Mono12 (default), Mono12p, Mono12Packed, Mono14, Mono16
Maximum frame rate	159 fps
Exposure time[1]	23 µs to 114 s
Exposure modes	Timed
Analog gain	0 dB to 18 dB | Increment: 0.1 dB
Digital gain	18.1 to 42 dB | Increment: 0.1 dB
Multiple ROI (H × V)	*Vertical*: 1 × 1 to 1 × 8
Image buffer (RAM)	480 MByte
Non-volatile memory	~4 GByte (eMMC)[2], 32 MByte (Flash)
Inputs and outputs	See Camera interfaces on page 99.
Digital interface	5GBASE-T or 2.5GBASE-T (NBASE-T) and 1000BASE-T
Camera controls	GenICam (GenICam Access)

[1] Maximum exposure value given is valid for 0 dB and sensor temperature of +20 °C.
For exposure times above 1 s, the image quality may deteriorate, NUC and DPC are disabled.

[2] Available memory depends on the stored correction data.

Table 20: Goldeye Pro G5-320 VSWIR TEC1 general specifications

Imaging performance

Parameter	Value (0 dB gain)(1)	Value (18 dB gain)(1)
Dark current	To be done	
Temporal dark noise (readout noise)	180 e^-	172 e^-
Signal-to-noise ratio(2)	max. 47.8 dB	max. 36.6 dB
Saturation capacity	61 ke^-	4.6 ke^-
Dynamic range	50.5 dB	36.6 dB
Pixel operability	>99.5%	

[1] Measured at 20 °C.

[2] Calculated from sensor saturation = 20 * log [SQR (Saturation capacity)].

Table 21: Goldeye Pro G5-320 VSWIR TEC1 imaging performance

Mechanics

Parameter	Values
Body dimensions (L × W × H) without lens mount adapter	78 mm × 55 mm × 55 mm
Lens mount	C-Mount
Mass, including lens mount	350 g

Table 22: Goldeye Pro G5-320 VSWIR TEC1 mechanical specifications

Operating conditions

Parameter	Values
Operating temperature	-15°C to +55 °C (housing)
Emergency shutdown temperature for TEC element[1]	+70 °C (*Sensor*)
Emergency shutdown temperature for sensor, TEC element[1]	+75 °C (*SensorBoard*)
Storage temperature	-30 °C to +70 °C (ambient)
Temperature control	Single-stage thermo-electric cooling (TEC1)
Sensor cooling temperature, setpoints[2]	• +20 °C (default and calibrated) • +5 °C, +35 °C, +50 °C (uncalibrated) • User-configurable
Relative humidity	10% to 95%, non-condensing

[1] Output by `DeviceTemperatureSelector` = *Sensor* or *SensorBoard*

[2] Even though the first temperature setpoint is pre-configured to +20 °C, it is possible to set it to other temperature values. Observe that condensation may occur if the sensor temperature is lower than the ambient temperature, especially in humid environments.
Models with RCG (Removed Cover Glass) sensor option:
+20 °C (default and calibrated), +35 °C, +50 °C (uncalibrated), user-configurable

Table 23: Goldeye Pro G5-320 VSWIR TEC1 operating conditions

NOTICE

RCG models: Damage to the sensor

Condensation can cause short circuits on the sensor.

- During operation, avoid condensation of humidity on the sensor.
- Set the `SensorTemperatureSetpointMode` feature to *Manual* (default), avoid using *Auto* mode.
- Set all values for `SensorTemperatureSetpointValue` carefully.
- Observe the description in the Handling Cameras with RCG and TCG Options application note, see the note below.

Temperature control on RCG models

To avoid damage to the sensor, read the description in the Handling Cameras with RCG and TCG Options application note: www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Power conditions

Parameter	Values
Power requirements (DC)	• 12 VDC to 24 VDC (±10%) • PoE (IEEE 802.3at Type 1, Class 0)
Maximum power consumption	• 11 W (12 to 24 VDC) • 12.9 W (PoE)
Typical power consumption without cooling	• 7 W (12 to 24 VDC) • 8 W (PoE)

Table 24: Goldeye Pro G5-320 VSWIR TEC1 power conditions

Absolute QE

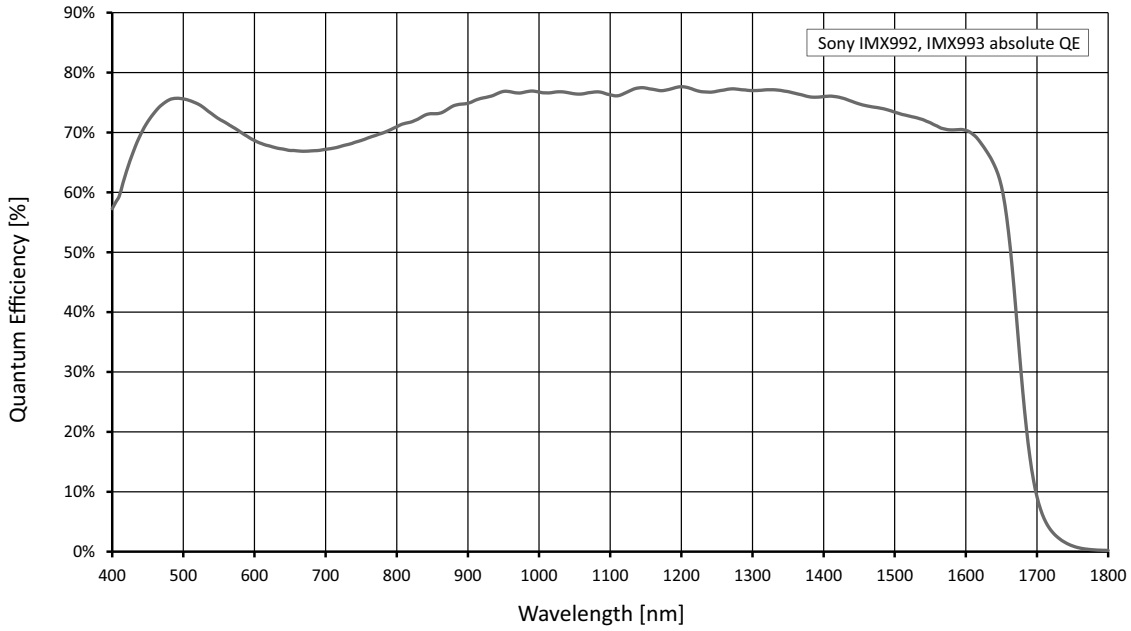


Figure 5: Goldeye Pro G5-320 VSWIR TEC1 (Sony IMX993) absolute QE
According to manufacturer data

ROI frame rates

Measurements were done at a bandwidth of 625 MByte/s.

Resolution	Width	Height	Mono8 (10-bit)[1]	Mono10 (10-bit)[1]	Mono10p (10-bit)[1]	Mono12 (12-bit)[1]	Mono12p (12-bit)[1]
Full resolution	2080	1544	159.2	96.0	153.6	92.4	
QXGA	2048	1536	159.9	98.0	156.8	92.9	
Full HD	1920	1080	222.2	148.7	222.2	129.0	
UXGA	1600	1200	201.5	160.6	201.5	117.0	
WXGA+	1440	900	261.4	236.8	261.4	151.8	
SXGA	1280	1024		233.3		135.5	
HD 720	1280	720		320.6		186.2	
XGA	1024	768		302.8		175.8	
SVGA	800	600		376.2		218.5	
VGA	640	480		455.2		264.3	
QVGA	320	240		784.3		455.4	
QQVGA	160	120		1227.0		712.8	
Max. × half	2080	776 (2)		299.9		174.2	
Max. × min.	2080	8		2597.4		1510.6	
Min. × max.	8	1544		159.2		92.4	
Min. × min.	8	8		2597.4		1510.6	

[1] Value for `SensorBitDepth`, see Sensor ADC readout modes for maximum frame rates on page 45.

[2] Value was rounded up to the next multiple of 8.

Table 25: Goldeye Pro G5-320 VSWIR TEC1 ROI frame rates

Goldeye Pro G5-530 VSWIR TEC1

General

Parameter	Values
Sensor model	Sony IMX992
Resolution	2592(H) × 2056(V); 5.3 MP
Sensor type	InGaAs
Shutter type	Global shutter (GS)
Sensor size	Type 1/1.4; 8.9 mm × 7.1 mm; 11.4 mm diagonal
Pixel size	3.45 µm × 3.45 µm
CRA	0 deg
Sensor bit depth (ADC)	10-bit, 12-bit; Adaptive (10-bit, 12-bit)
Monochrome pixel formats	Mono8, Mono10, Mono10p, Mono10Packed, Mono12 (default), Mono12p, Mono12Packed, Mono14, Mono16
Maximum frame rate	115 fps
Exposure time[1]	23 µs to 114 s
Exposure modes	Timed
Analog gain	0 dB to 18 dB | Increment: 0.1 dB
Digital gain	18.1 to 42 dB | Increment: 0.1 dB
Multiple ROI (H × V)	*Vertical*: 1 × 1 to 1 × 8
Image buffer (RAM)	480 MByte
Non-volatile memory	~4 GByte (eMMC)[2], 32 MByte (Flash)
Inputs and outputs	See Camera interfaces on page 99.
Digital interface	5GBASE-T or 2.5GBASE-T (NBASE-T) and 1000BASE-T
Camera controls	GenICam (GenICam Access)

[1] Maximum exposure value given is valid for 0 dB and sensor temperature of +20 °C.
For exposure times above 1 s, the image quality may deteriorate, NUC and DPC are disabled.

[2] Available memory depends on the stored correction data.

Table 26: Goldeye Pro G5-530 VSWIR TEC1 general specifications

Imaging performance

Parameter	Value (0 dB gain)[1]	Value (18 dB gain)[1]
Dark current	To be done	
Temporal dark noise (readout noise)	180 e^-	172 e^-
Signal-to-noise ratio[2]	max. 47.8 dB	max. 36.6 dB
Saturation capacity	61 ke^-	4.6 ke^-
Dynamic range	50.5 dB	36.6 dB
Pixel operability	>99.5%	

[1] Measured at 20 °C.

[2] Calculated from sensor saturation = 20 * log [SQR (Saturation capacity)].

Table 27: Goldeye Pro G5-530 VSWIR TEC1 imaging performance

Mechanics

Parameter	Values
Body dimensions (L × W × H) without lens mount adapter	78 mm × 55 mm × 55 mm
Lens mount	C-Mount
Mass, including lens mount	350 g

Table 28: Goldeye Pro G5-530 VSWIR TEC1 mechanical specifications

Operating conditions

Parameter	Values
Operating temperature	-15°C to +55 °C (housing)
Emergency shutdown temperature for TEC element[1]	+70 °C (*Sensor*)
Emergency shutdown temperature for sensor, TEC element[1]	+75 °C (*SensorBoard*)
Storage temperature	-30 °C to +70 °C (ambient)
Temperature control	Single-stage thermo-electric cooling (TEC1)
Sensor cooling temperature, setpoints[2]	• +20 °C (default and calibrated) • +5 °C, +35 °C, +50 °C (uncalibrated) • User-configurable
Relative humidity	10% to 95%, non-condensing

[1] Output by `DeviceTemperatureSelector` = *Sensor* or *SensorBoard*

[2] Even though the first temperature setpoint is pre-configured to +20 °C, it is possible to set it to other temperature values. Observe that condensation may occur if the sensor temperature is lower than the ambient temperature, especially in humid environments.
Models with RCG (Removed Cover Glass) sensor option:
+20 °C (default and calibrated), +35 °C, +50 °C (uncalibrated), user-configurable

Table 29: Goldeye Pro G5-320 VSWIR TEC1 operating conditions

NOTICE

RCG models: Damage to the sensor

Condensation can cause short circuits on the sensor.

- During operation, avoid condensation of humidity on the sensor.
- Set the `SensorTemperatureSetpointMode` feature to *Manual* (default), avoid using *Auto* mode.
- Set all values for `SensorTemperatureSetpointValue` carefully.
- Observe the description in the Handling Cameras with RCG and TCG Options application note, see the note below.

Temperature control on RCG models

To avoid damage to the sensor, read the description in the Handling Cameras with RCG and TCG Options application note: www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Power conditions

Parameter	Values
Power requirements (DC)	• 12 VDC to 24 VDC (±10%) • PoE (IEEE 802.3at Type 1, Class 0)
Maximum power consumption	• 11 W (12 to 24 VDC) • 12.9 W (PoE)
Typical power consumption without cooling	• 7 W (12 to 24 VDC) • 8 W (PoE)

Table 30: Goldeye Pro G5-530 VSWIR TEC1 power conditions

Absolute QE

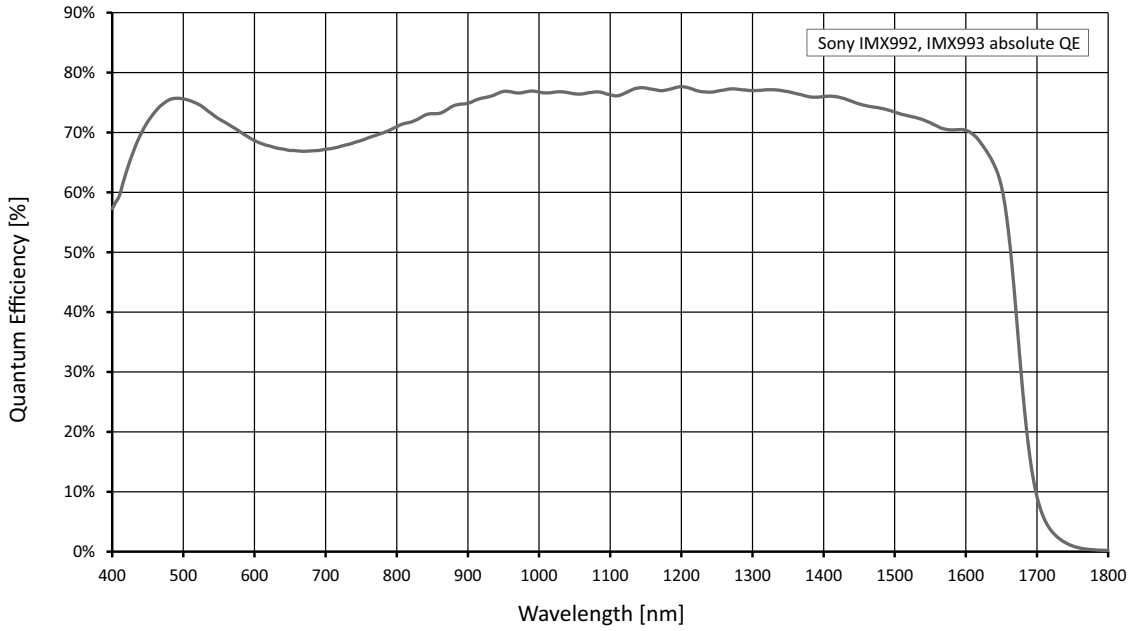


Figure 6: Goldeye Pro G5-530 VSWIR (Sony IMX992) absolute QE
According to manufacturer data

ROI frame rates

Measurements were done at a bandwidth of 625 MByte/s.

Resolution	Width	Height	Mono8 (10-bit)[1]	Mono10 (10-bit)[1]	Mono10p (10-bit)[1]	Mono12 (12-bit)[1]	Mono12p (12-bit)[1]
Full resolution	2592	2056	115.7	57.9	92.6	57.9	70.7
QSXGA	2560	2048	117.6	58.8	94.1	58.8	70.9
WQHD	2560	1440	167.3	83.6	133.8	83.6	99.2
QXGA	2048	1536	160.7	98.0	156.8	93.3	
Full HD	1920	1080	223.7	148.7	223.7	129.9	
UXGA	1600	1200	202.8	160.6	202.8	117.8	
WXGA+	1440	900		263.6		153.0	
SXGA	1280	1024		235.0		136.5	
HD 720	1280	720		323.8		188.0	
XGA	1024	768		305.6		177.5	
SVGA	800	600		380.7		221.0	
VGA	640	480		461.7		268.1	
QVGA	320	240		803.2		466.6	
QQVGA	160	120		1275.5		740.7	
Max. × half	2592	1032 (2)	230.5	115.3	184.4	115.3	
Max. × min.	2592	8		2824.9		1642.0	
Min. × max.	8	2056		121.7		70.7	
Min. × min.	8	8		2824.9		1642.0	

[1] Value for `SensorBitDepth`, see Sensor ADC readout modes for maximum frame rates on page 45.

[2] Value was rounded up to the next multiple of 8.

Table 31: Goldeye Pro G5-530 VSWIR TEC1 ROI frame rates

Dimensions, mass, and maximum protrusion

Feature	Values
Body dimensions (L × W × H [mm])	78 × 55 × 55
Mass	350 g

Table 32: Camera dimensions and mass

NOTICE

Damage to the sensor or optics by unsuitable lenses

The sensor, filter, or lens can be damaged if a lens exceeding maximum protrusion is mounted to the camera.

- Use lenses with less than the allowed maximum protrusion, see Table 33.
- See Mounting the lens on page 83.

Lens mount

Feature	Values
Lens Mount	C-Mount
Flange focal distance, optical	17.526 mm
Thread	1“-32tpi UNS-2B
Suitable optical filter, diameter	Filters with C-Mount ring
Suitable optical filter, thickness	Depending on the filter
Maximum protrusion[1] **no filter**	11.7 mm
[1] See Maximum protrusion of the C-Mount (schematic view) below.	

Table 33: Lens mount dimensions, mass, and maximum protrusion

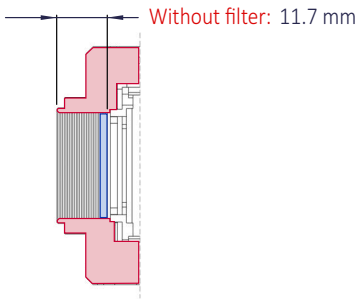


Figure 7: Maximum protrusion of the C-Mount (schematic view)

Figure 8 shows a schematic view of dimensions between sensor surface, sensor cover glass, and front flange of the camera housing. Table 34 shows the corresponding values by Goldeye Pro G5 model.

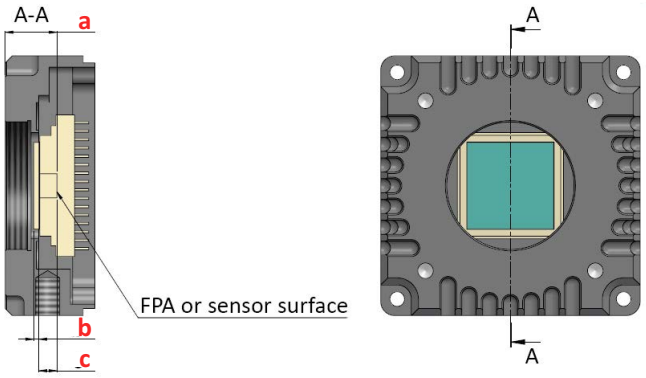


Figure 8: Sensor and mount dimensions (schematic view)

Goldeye Pro	C-Mount flange focal distance[1]	a: Distance FPA[2] to front surface of front flange	b: Thickness of sensor cover glass	c: Distance FPA[2] to sensor cover glass
G5-130 VSWIR TEC1	17.793 mm	11.562 mm	1.1 mm	3.83 mm
G5-320 VSWIR TEC1	17.793 mm	11.27 mm	1.1 mm	3.8 mm
G5-530 VSWIR TEC1	17.793 mm	11.27 mm	1.1 mm	3.8 mm

[1] Mechanical, without filter | [2] Active surface

Table 34: Sensor and mount dimensions by model

Technical drawings

Model overview

You can find drawings for the corresponding models on pages:

Model	C-Mount
Goldeye Pro G5-130 VSWIR TEC1	64
Goldeye Pro G5-320 VSWIR TEC1	65
Goldeye Pro G5-530 VSWIR TEC1	65

Table 35: Technical drawings by model

Goldeye Pro G5-130 VSWIR TEC1 with C-Mount

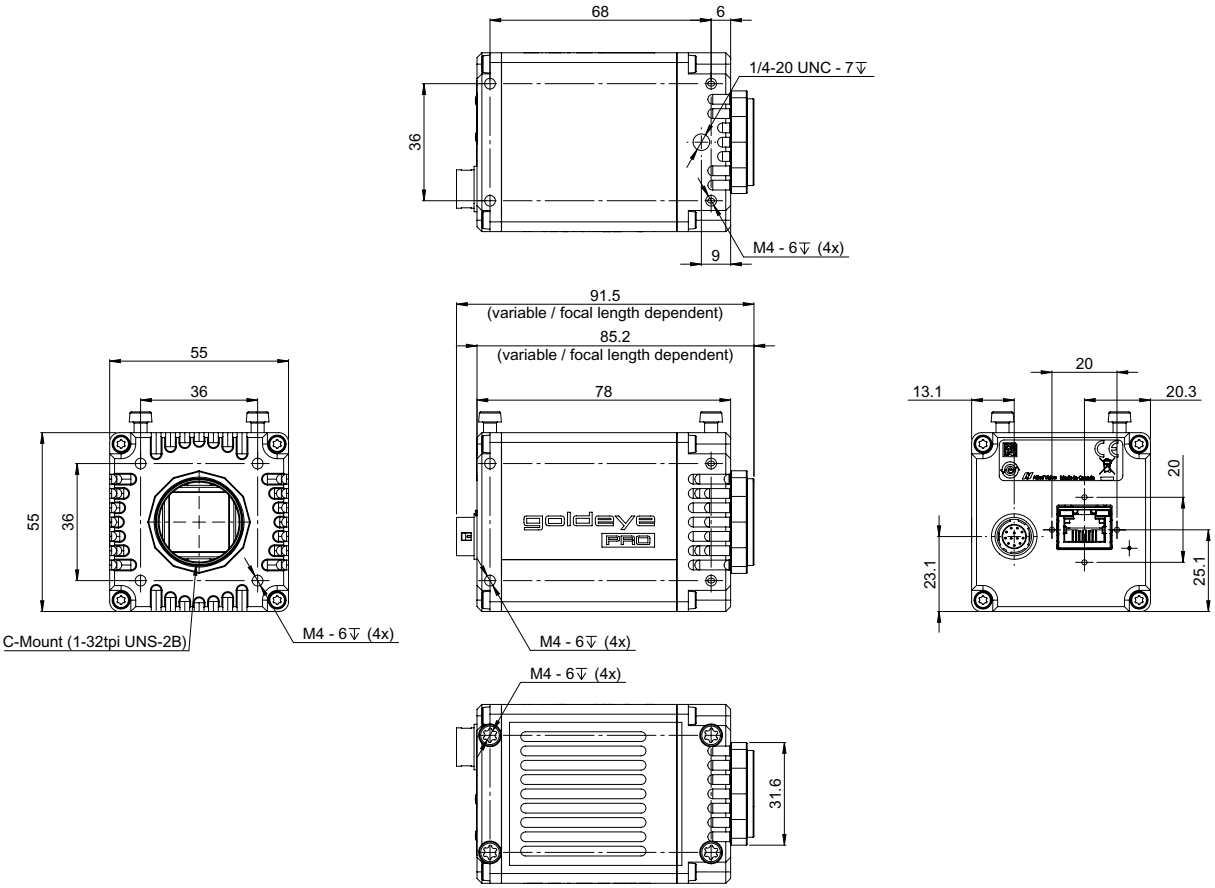


Figure 9: Goldeye Pro G5 -130 VSWIR TEC1 with C-Mount

Goldeye Pro G5-320/530 VSWIR TEC1 with C-Mount

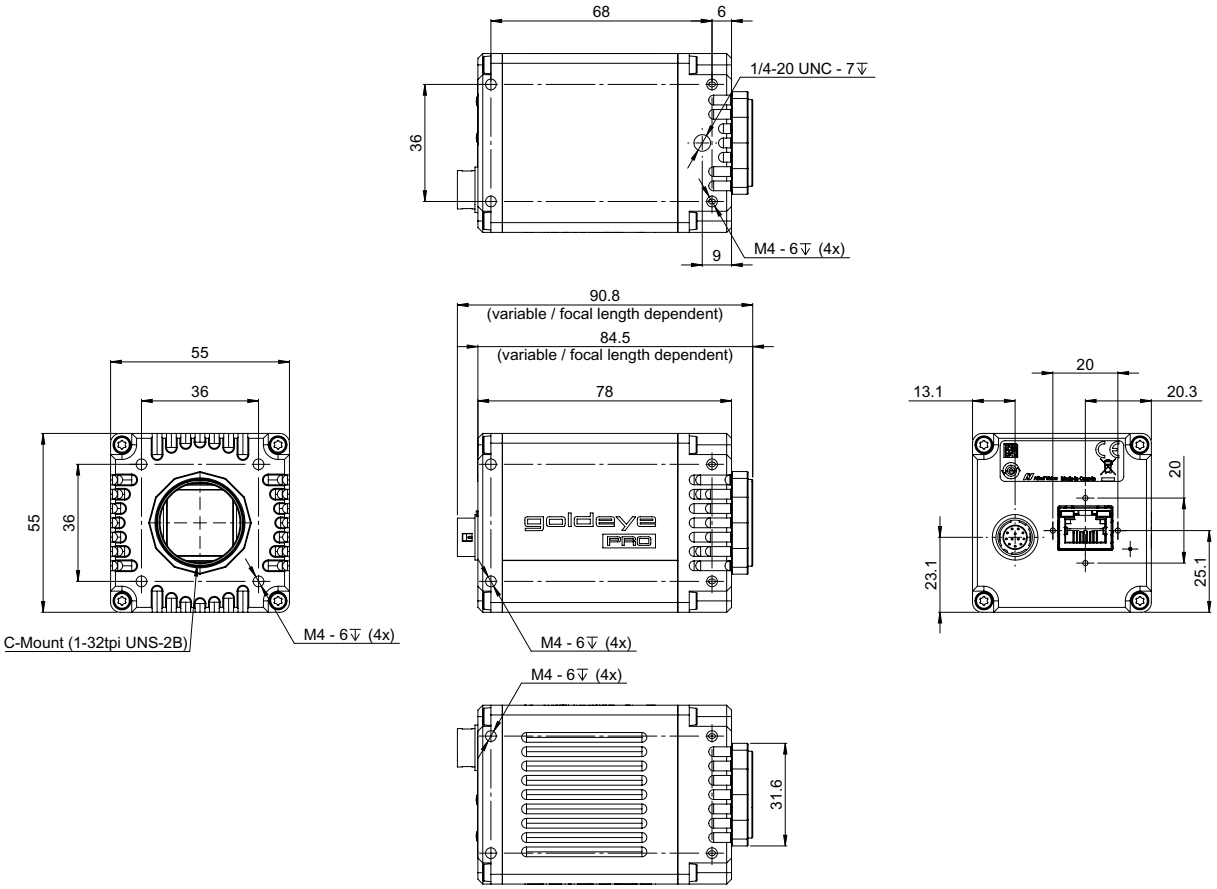
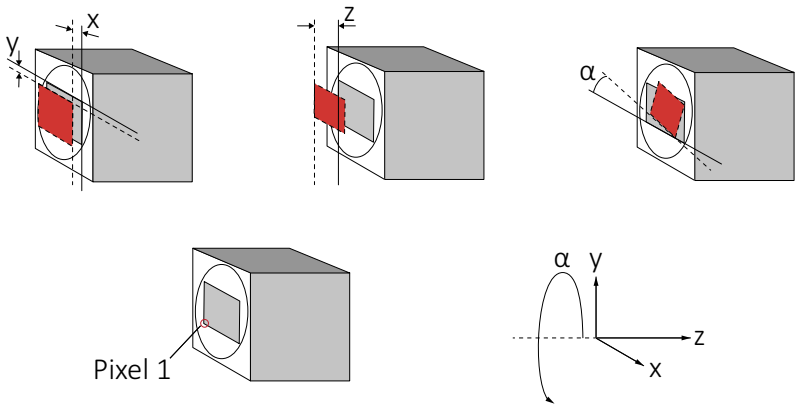


Figure 10: Goldeye Pro G5 -320/530 VSWIR TEC1 with C-Mount

Sensor position accuracy

Sensor shift and rotation



Gray rectangle: Reference sensor position **Red rectangle**: Current position
Straight line: Reference edge **Dotted line**: Current reference edge

The orientation of the z-axis deviates from scientific conventions to define tolerances of the flange focal distance.

Figure 11: Sensor shift and rotation

The following table defines the manufacturing accuracy for sensor positioning.

Criteria	Subject	Properties
Alignment method		Optical alignment of the photosensitive sensor area into the camera front module (lens mount front flange)
Reference Points	Sensor	Center of the pixel area (photo sensitive cells)
	Camera	Center of the lens mount
Accuracy	x/y-axis [1]	±150 µm (sensor shift)
	z	+0 µm to -200 µm (optical back focal length)
	α[1]	±0.5 deg (sensor rotation as the deviation from the parallel to the camera bottom)
[1] X/Y- tolerances between the C-Mount hole and the pixel area may be higher.		

Table 36: Goldeye Pro G5 cameras, criteria of sensor position accuracy

Camera feature availability

Goldeye Pro G5 cameras support a number of standard and extended features. The following tables compare the availability of selected features by model.

Feature descriptions

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Image control	Supported models
Auto contrast	All
Auto exposure	All
Black level	All
Contrast	All
Digital binning	All
DPC (defect pixel correction)	All
High Conversion Gain	All **except for** Pro-G5-130 VSWIR TEC1
Look up table (LUT)	All
Multiple ROI (region of interest)	All
NUC (non-uniformity correction)	All
Sensor line equalization (`BlackLevelEqualizationMode`)	All
Single ROI (region of interest)	All

Table 37: Image control features by Goldeye Pro G5 model

Camera control	Supported models
Acquisition frame rate	All
Bandwidth control (`DeviceLinkThroughputLimit`)	All
Firmware update in the field	All
I/O and trigger control	All
Sensor ADC readout modes (`SensorBitDepth`)	All
User sets	All

Table 38: Camera control features by Goldeye Pro G5 model

Temperature control	Supported models
Temperature monitoring	All
Sensor temperature control (automatic or manual)	All

Table 39: Temperature control features by Goldeye Pro G5 model

Lenses and filters

This chapter includes:

About this chapter

This section presents tables that list selected fields of view (FOV) depending on sensor size, distance, and focal length of the lens.

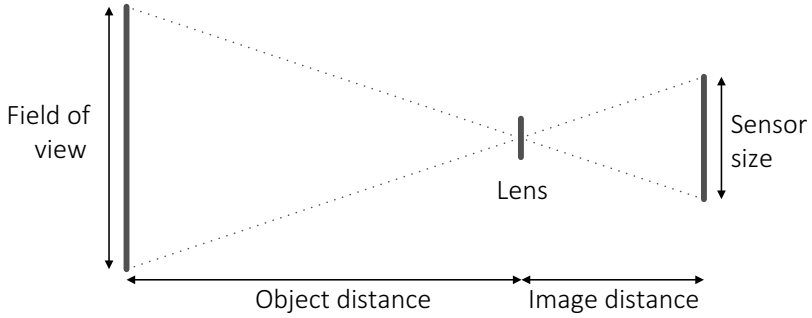


Figure 12: Parameters used in tables for focal length versus FOV

Parameters in tables

The distance to the object is measured from the first principal the plane of the lens to the object. For some lenses, manufacturers do not define the principal plane position. Production spread causes tolerances for all values, including actual focal lengths. Calculations apply for image reproduction without distortion. Therefore, values do not apply for fisheye lenses.

Please ask your Allied Vision Sales representative in case you need more information.

Optical vignetting with certain lenses

Lenses with short focal lengths may show optical vignetting at the edges of the image. Microlenses on the sensor pixels can increase the effect.

For demanding applications, we suggest testing camera and lens to find a suitable setup. If you have questions, please contact your Allied Vision Sales representative.

Focal length versus field of view

Goldeye Pro G5-130 VSWIR TEC1

Values for G5-130 VSWIR TEC1 cameras with Type 1/2 (8.2 mm diagonal) sensors:

Focal length [mm]	Field of view (H × V [mm])	
	Object distance = 500 mm	Object distance = 1000 mm
5	671 × 560	1348 × 1125
6	558 × 466	1122 × 937
8	417 × 348	840 × 701
12	275 × 230	558 × 466
16	205 × 171	417 × 348
25	129 × 107	264 × 221
35	90 × 75	187 × 156
50	61 × 51	129 × 107

Table 40: Focal length versus field of view for Goldeye Pro G5-130 VSWIR TEC1

Goldeye Pro G5-320 VSWIR TEC1

Values for G5-320 VSWIR TEC1 cameras with Type 1/1.8 (8.9 mm diagonal) sensors:

Focal length [mm]	Field of view (H × V in [mm])	
	Object distance = 500 mm	Object distance = 1000 mm
6	591 × 439	1189 × 882
8	441 × 328	890 × 661
12	292 × 217	591 × 439
16	217 × 161	441 × 328
25	136 × 101	280 × 208
35	95 × 71	198 × 147
50	65 × 48	136 × 101
75	41 × 30	89 × 66

Table 41: Focal length versus field of view for Goldeye Pro G5-320 VSWIR TEC1

Goldeye Pro G5-530 VSWIR TEC1

Values for G5-530 VSWIR TEC1 cameras with Type 1/1.4 (11.4 mm diagonal) sensors:

Focal length [mm]	Field of view (H × V in [mm])	
	Object distance = 500 mm	Object distance = 1000 mm
6	736 × 584	1481 × 1175
8	550 × 436	1109 × 880
12	364 × 288	736 × 584
16	271 × 215	550 × 436
25	170 × 135	349 × 277
35	119 × 94	247 × 196
50	80 × 64	170 × 135
75	51 × 40	110 × 87

Table 42: Focal length versus field of view for Goldeye Pro G5-530 VSWIR TEC1

Filters for your Goldeye Pro G5

This chapter informs about different filters for Goldeye Pro G5 cameras:

Product code	Description
1450	Bandpass filter BP 1450 nm Ø 25.4 mm FWHM: 35 nm | tolerance: ±10 nm
920	Longpass (visible cut-off) LP920-25.4 Ø 25.4 mm

Table 43: Filter for Goldeye Pro G5 models with C-Mount

Available filters

The Modular Concept lists a selection of **standard options**, for Bandpass filter BP 1450 and Longpass LP920, see the Spectral transmission of filters chapter: www.alliedvision.com/fileadmin/content/documents/products/cameras/various/modular-concept/ModularConcept_external.pdf

Please contact your Allied Vision representative for **more options:** www.alliedvision.com/en/avt-locations/avt-distributors

Filter terms explained

In general, these types of filters are used to filter visible and invisible wavelengths of various frequencies:

- **Bandpass filters** are translucent for a certain wavelength, rejecting all wavelengths above and below the defined range.
- **Longpass filters** are translucent from a certain wavelength onwards and for all wavelengths above it, thus rejecting all wavelengths below.
- **Visible cut-off filters** are a subset of longpass filters that prevent visible light from passing to the sensor.
- **Shortpass filters** are translucent up to a certain wavelength and for all wavelengths below, thereby rejecting all wavelengths above.
- **Notch** or **band reject filters** are translucent for all wavelengths above and below a defined range, thereby rejecting all wavelengths of that range. A Band Reject filter can be seen as the opposite of a Bandpass filter.

Bandpass filters

The Goldeye Pro G5 responds to wavelengths from about 400 nm to 1700 nm. Bandpass filter can be used to limit the bandwidth to a certain range of wavelengths.

Filters are defined by the optical density and the spectral transmission. Most characteristic are the **CWL** (center wavelength) and the **FWHM** (full width at half maximum), describing the bandwidth.

Bandpass filters can cut the transmitted frequencies more or less sharply.

Passband

The passband is the band of wavelengths that the filter allows to pass. Generally, the passband refers to the range of wavelengths between the **Cut-on** and **Cut-off** wavelengths. Therefore, most often the passband is described using the central wavelength and the FWHM.

Stopband

The stopband is the range of wavelengths over which unwanted signals are attenuated. Bandpass filters have two stopbands, one above and one below the passband. As a rule, the end of the stopbands is not precisely defined.

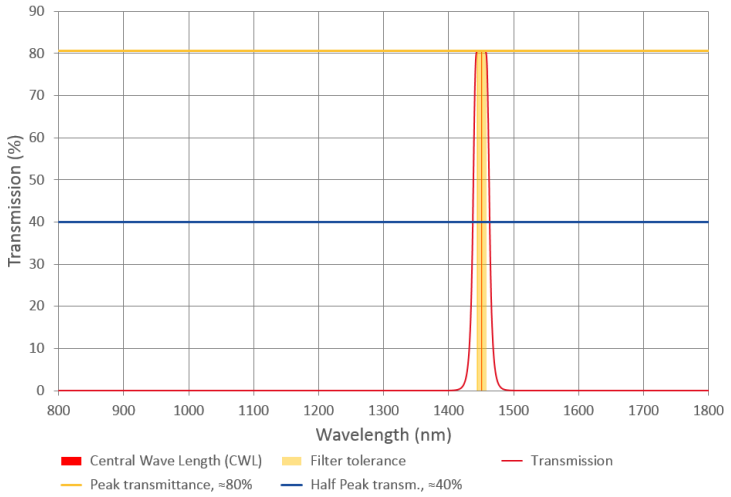


Figure 13: Example of a response curve of a bandpass water filter

CWL (=central wavelength)

The wavelength at the center of the filter's passband. This wavelength is the arithmetical mean of the Cut-on and Cut-off wavelengths.

Cut-on and Cut-off wavelength

The Cut-on wavelength is the wavelength within the transition slope from rejection to pass where the transmittance is at 50% of peak transmittance. The Cut-off wavelength is the wavelength within the transition slope from pass to rejection where the transmittance is at 50% of peak transmittance. The range between both wavelengths is called the **FWHM**.

Peak Transmittance

Also referred to as filter **Transmission Rate**. The peak transmittance describes the maximum amount of light that a filter allows to pass. No filter allows 100% of the light to pass, however, good quality filters allow more light to pass through, thus their transmission rate is closer to 100%. Filters of lower quality appear darker, they transmit only slightly more than 50% of the light.

Tolerance

The range of wavelengths within the passband, equally on both sides of the central wavelength, that provide transmission rates very close to the peak transmittance around the center wavelength.

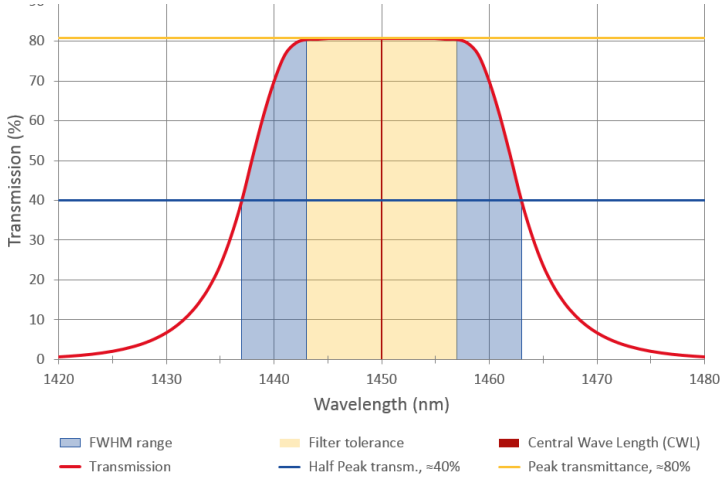


Figure 14: Detail of the water filter shown in Figure 13*, CWL = 1450 nm* ±7 nm, FWHM = 26.5 nm

FWHM (Full Width at Half Maximum)

Also called **Half Bandwidth**. Defines the width of the passband of a bandpass filter. It is defined as the range of wavelengths on either side of the CWL where the transmission rate is one half of the peak transmittance or higher.

Half Power Points

Points on both sides of the passband curve of a filter, with a transmission rate that is half of the peak transmittance; the range of wavelengths between these points is called the **FWHM**. The arithmetical mean of the wavelengths of these points is called the **CWL**. The half power points define the **Cut-on** and **Cut-off** wavelengths.

Single and multi band filters

Single band filters provide only one passband.
Multi band filters provide two or more passbands that are separated by a rejection band.

Bandpass filters 1450 nm (water filters)

As an example, the center wavelength of a water filter displayed in Figure 14 is 1450 nm with a tolerance of ±7 nm, and a FWHM bandwidth of 26.5 nm. The maximum transmission of the passband is around 80%. Therefore, the FWHM in this example is defined as the range of frequencies around the CWL where the transmission is 40% or above.

Installing the camera

This chapter includes:

Touching hot cameras

CAUTION

Risk of burns

A camera in operation can reach temperature levels which could cause burns.

- Wear protective gloves when you touch a camera that is heated up.
- Ensure proper cooling of the camera.
- See Providing optimum heat dissipation on page 34.

Electrostatic discharge

NOTICE

ESD is dangerous for electronic devices, especially when tools or hands get in contact with connectors. We recommend measures to avoid damage by ESD:

- Unpacking: Remove the camera from its anti-static packaging only when your body is grounded.
- Workplace: Use a static-safe workplace with static-dissipative mat and air ionization.
- Wrist strap: Wear a static-dissipative wrist strap to ground your body.
- Clothing: Wear ESD-protective clothing. Keep components away from your body and clothing. Even if you are wearing a wrist strap, your body is grounded but your clothes are not.

Mounting the heat sink

The current temperature value is output by `DeviceTemperature`. Keep the operating temperature in the specified range. In many cases, mounting the camera on a metal surface or using a lens will be sufficient to cool the camera effectively.

However, especially when operated in higher ambient temperatures, additional measures for heat dissipation, such as using a heat sink, should be considered.

Goldeye heat sink kit

We recommend using the 1068300 Heat Sink Kit for Goldeye Pro G5 and Goldeye G/CL. The kit consists of one heat sink with thermal pad mounted, screws, and angled screw driver. Up to four heat sinks can be fitted to one camera.

Heat sink kit

For more information, see the Goldeye G/CL, Goldeye Pro G5 Heat Sink Kit User Guide at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Precautions

NOTICE

Damage to the camera by heat sinks mounted improperly

Adhere to the instructions and safety notes provided by the manufacturer of the heat sink.

NOTICE

Damage to the sensor, filter, and lens by corrosive substances

Some conductive media for heat sinks contain corrosive substances that can damage optical surfaces of the sensor, filter, and lens.

- Cover the optical path of the camera when you apply heat sink compound or adhesive to prevent substances and fumes from damaging optical surfaces.
- Adhere to the instructions and safety notes provided by the manufacturer of the conductive media.

Mounting the camera

CAUTION

Injury by falling cameras or lenses

A falling camera or lens can cause injury.

- Ensure proper mounting of cameras and lenses, especially for dynamic applications.
- Mount cameras as described in the instructions.
- Use all 4 bottom mounting threads for applications with high acceleration.
- Always make sure the mounting threads are intact.
- Fasten screws with maximum torque, using the entire thread engagement. For less thread engagement, see Adapting maximum torque values on page 80.
- We recommend you to apply thread locking.
- Use a lens support for heavy lenses.

The maximum torque value applies only if the entire thread engagement is used. For other values, see Adapting maximum torque values on page 80.

The camera can be mounted to horizontal or vertical bases, using

- 4 mounting threads for top and bottom mounting
- 4 mounting threads for lateral mounting
- 4 mounting threads for front mounting

The backside has no mounting holes.

M4 ↓6.0 ↓7.5
A=M4 | B=0 | C=6.0 | D=7.5

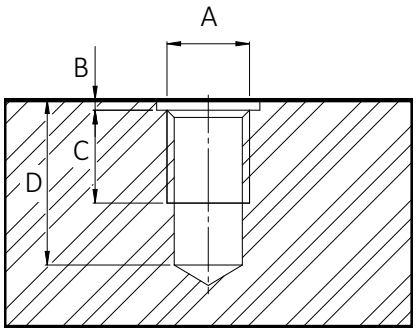


Figure 15: Mounting threads

1. Mount the camera to the base using suitable M4 screws at 2.7 Nm maximum torque for a thread engagement (C) of 6 mm between screws and mounting threads, see Figure 15. For details, see your model's technical drawings.
2. Continue with Mounting the lens on page 83.

Adapting maximum torque values

The total bolt length composes of the mounting holes length and the height of your mounting base.

For using less than the stated length of thread engagement, calculate maximum torque as follows:

$$\frac{\textbf{Current length of thread engagement}}{\text{Length of thread engagement in table}} \times \text{Torque in table} = \textbf{Current torque}$$

This example relates to Goldeye Pro G5 mounting for a length of thread engagement of **5 mm** instead of 6 mm: **5 mm** / 6 mm × 2.7 Nm = **2.3 Nm**

Thread type	Total protrusion	Length of thread engagement	Maximum torque
M4	6 mm	6 mm	2,7 Nm
M4	6 mm	**5 mm**	**2,3 Nm**

Table 44: Adjusting maximum torque values

To ensure that the bolts do not become loose over time, we recommend you to use means for securing bolts, such as screw locking varnish.

1/4” -20 UNC mounting thread

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

Using the C-Mount

Adjusting the C-Mount

Cameras are calibrated at delivery

You do not need to adjust the C-Mount of a new camera. The flange focal distance has been adjusted precisely at manufacturing.

Flange focal distance is the optical distance from the mounting flange to image sensor die. Goldeye Pro G5 cameras with C-Mount are calibrated for a flange focal distance of standard 17.526 mm.

Sometimes the C-Mount must be adjusted; for example, to compensate for C-Mount lenses that deviate from the specified flange focal distance. In this case, follow the instructions in this section.

Preconditions

- Goldeye Pro G5 camera (model range see above) with C-Mount
- C-Mount lens with a long focal length, or an adjustable zoom lens that can be focused to infinity
- Target at minimum 10 to 15 meters distance with clear structures for easy focusing
- Locking wrench, Allied Vision product code 02-5003A

Contact the Allied Vision Sales team to purchase the hexagonal lens adjustment wrench for C-Mount locking rings of Goldeye Pro G5 (product code 02-5003A).

Part description

Figure 16 shows the C-Mount ring and the tool to loosen and tighten the locking ring.

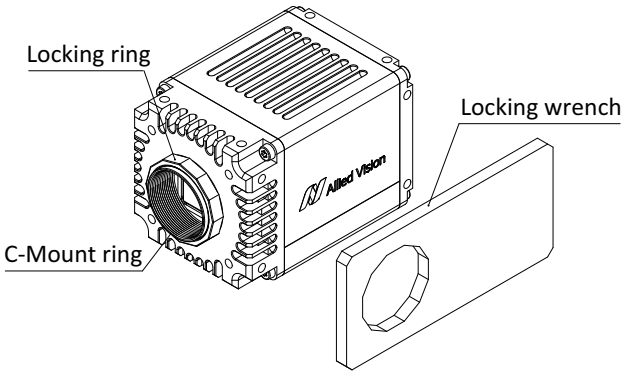


Figure 16: Goldeye Pro G5 camera with C-Mount and locking wrench

Instructions

1. Make sure the C-Mount lens is threaded firmly onto the C-Mount ring.
2. Loosen the locking ring. Be careful not to scratch the camera.
3. When the locking ring is loose, unthread it a few turns from the camera face.
4. Point the lens towards the target.
5. Set the lens to infinity.
6. Rotate the lens and C-Mount ring in both directions until the image is focused.
7. Tighten the locking ring.
8. Recheck the focus.
9. If focus has been lost, continue with Step 2.
10. If the image is still in focus, you are done.

Replacing filters

Preconditions

- Goldeye Pro G5 camera (model range see above) with C-Mount
- Suitable filter and wrench.

Part description

Figure 17 shows the wrench to replace filters.

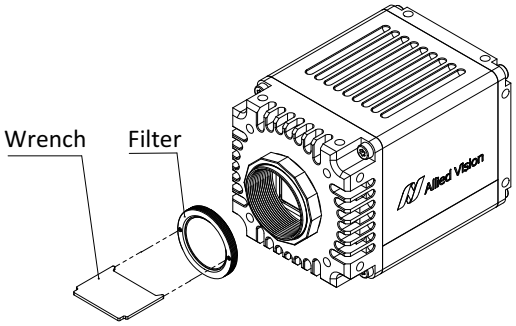


Figure 17: Goldeye Pro G5 camera with C-Mount, filter, and locking wrench

Inserting filters

Keep dust away

We recommend you to hold the camera with the lens mount facing the ground to keep dirt out.

1. Remove the lens or protection cap from the C-Mount.
2. Place the filter on the wrench, with the pins of the wrench fitting into the holes of the filter ring.
3. Holding the filter with the wrench, engage the filter to the C-Mount.
4. Screw the filter clockwise into the C-Mount until you feel resistance.
5. Place a lens or protection cap on the C-Mount to keep dust away.

Removing filters

1. Remove the lens or protection cap from the C-Mount.
2. Insert the pins of the wrench into the holes of the filter ring.
3. Screw the filter counter clockwise out of the C-Mount.
4. Place a lens or protection cap on the C-Mount to keep dust away.
5. Store the filter protected from dust.

Mounting the lens

Observe the following notes before you mount lenses to Goldeye Pro G5 cameras.

CAUTION

Injury by falling cameras or lenses

A falling camera or lens can cause injury.

- Ensure proper mounting of cameras and lenses, especially for dynamic applications.
- Mount cameras as described in the instructions.
- Use a lens support for heavy lenses.

CAUTION

Risk of cuts by sharp edges of lens mounts

The threads of the lens mount can have sharp edges.

Be careful when mounting or unmounting lenses.

NOTICE

Damage to sensor or optics by unsuitable lenses

The sensor, filter, or lens can be damaged if a lens exceeding maximum protrusion is mounted to the camera.

- Use lenses only up to the specified maximum protrusion.

Powering up the camera

Powering the camera via I/O port

When cameras are powered by both the 12-pin Hirose I/O port and by PoE, power by the I/O port is used.

NOTICE

Damage to the camera electronics

- Use only DC power supplies that comply with the camera specifications and that have insulated cases.
- For all cable connections, use only shielded cables to avoid electromagnetic interference.

External power supply

For a suitable external power supply, see www.alliedvision.com/en/products/accessories.

Powering the camera via PoE

Please note the following when using PoE NICs and PoE injectors with Allied Vision PoE-capable Goldeye Pro G5 cameras:

Feature	Specification
Supported standard	IEEE 802.3at Type 1, Class 0
Cable category	We recommend you to use Category 6 cables for better performance.
PSE	Power Sourcing Equipment (PSE) must support data over all 4 pairs and must be rated for the intended link speed.

Table 45: Powering the camera via PoE

Configuring the host computer

Please consider

Goldeye Pro G5 cameras require different hardware and settings than 1000BASE-T cameras like Goldeye G cameras. We suggest you:

- Build up general knowledge: on page 126.
- Find solutions for issues: Troubleshooting common issues on page 136.

Goldeye Pro G5 cameras can operate on network ports supporting 5GBASE-T, 2.5BGBASE-T, and 1000BASE-T.
100MBit mode known from Goldeye G is not supported.

Requirements to reach the maximum camera frame rate:

- 5GBASE-T speed or faster PCI Express NIC **on Desktop PCs**
- USB adapters **on laptops**: As of writing this document, USB adapters in general are not recommended due to performance limits.
- Jumbo Packet support for minimum 9,000 to 16,000 bytes. See Enabling Jumbo Packets on page 87.

Recommendations

- Use only one camera per network port. For more than one camera, use additional NICs or NICs with more than one port.
  Aggregation of multiple cameras: If you cannot avoid aggregating multiple cameras to one fast NIC port via switches, the additional complexity in throughput management requires careful system design and testing.
- Disable all unused NIC services and protocols (for example, activate only filter drivers for IPv4 and GigE).
- You can select between Fixed Link Speed and Auto Negotiation for the NIC driver's link speed settings.
  - **Auto Negotiation**: We recommend using Auto Negotiation. The maximum link speed supported by the host system and the camera is set automatically. Therefore, the common link speed for the camera and host system may be lower than the maximum supported link speed of one of the two.
  - **Fixed Link Speed:** If you set a link speed not supported by the camera, the link is not negotiated. Note that a link may not come up due to an issue with the hardware or cabling.
    Goldeye Pro G5 cameras support 5 Gbit/s for full performance, 2.5 Gbit/s, or 1 Gbit/s for host systems that do not support 5 Gbit/s.

NOTICE

Network security

If cameras are used on mixed-use networks (with printers, Internet, and email), the network security may be affected, the camera performance as well.

- Use cameras only in trusted networks as required by the GigE Vision protocol.
- Check with your network administrator if required for network configuration.

Installing and configuring NICs

Selecting NICs

See NIC hardware on page 127 for recommendations.

Installing NICs

Connect NICs directly to PCIe lanes of the CPU. If the NIC is connected to the chipset, ensure that the bandwidth between chipset and CPU is sufficient. Example: A NIC and an NVME SSD connected to the chipset, can create a bottleneck between chipset and CPU.

Installing the NIC driver

Install the NIC driver from your network card manufacturer if available. If no installation application is provided, update the driver manually.

Linux: Updating the driver manually

Follow the instructions by the NIC manufacturer.

Windows: Updating the driver manually

1. Open the **Device Manager** with administrator permission.
2. Under **Network Adapters**, locate the Ethernet network adapter, right-click the entry, and select **Update Driver Software** in the menu.
3. Select the **Search automatically for updated driver software or Browse my computer for driver software**.
4. Click **Close** after the driver has been installed.

Adjusting the NIC driver settings

The NIC should be adjusted to improve system performance when using Goldeye Pro G5 cameras. This minimizes the CPU usage in order to avoid dropped or resent packets.

Edit the NIC driver properties according to the values in Table 46: NIC driver settings on page 87. The names and availability of the properties listed may vary depending on:

- NIC manufacturer
- Operating system
- Camera model.

Property	Value
Packet Size, Frame Size, Jumbo Packet, or Maximum Transmission Unit	Maximum value configurable
Interrupt moderation	Enable
Interrupt moderation rate	Start with NIC's default value and experiment with different setting if required
Receive buffers	Maximum value configurable
Flow Control or Pause Frames	Enable

Table 46: NIC driver settings

Default packet size

At startup, Goldeye Pro G5 cameras have a default packet size of 576 bytes on the device stream channel. This enables optimum backward compatibility when ancient network hardware is used or when the network packets are tunneled through other protocols. Consider, that this packet size creates a large overhead on the host, which does not allow the full throughput most likely.

Enabling Jumbo Packets

We recommend you to increase the packet size to the maximum value supported by all parts of the system. The effective packet size should be at least around **9,000 bytes**. Configure the NIC settings as follows:

1. Open the **Device Manager** with administrator permission.
2. Under **Network Adapters**, locate the Ethernet network adapter, right-click the entry, and select **Poperties** in the menu.
3. Adjust the corresponding settings to match the values required in Table 46.

Easy adjustment of the packet size

We recommend using **Vimba X** to adjust the packet size on connected cameras or you can use the Vmb APIs of **Vimba X**.
Download www.alliedvision.com/en/products/software/vimba-x-sdk.

Advanced NIC driver settings

5GBASE-T mode

The 5GBASE-T mode must be enabled on some NICs and SFP modules.

- Enable sufficient bandwidth for NICs on the PCIe link: minimum 1 × 8 GT/s or 2 × 5 GT/s or 4 × 2.5 GT/s is required for one Goldeye Pro G5 camera.
  Under **Windows**, you can use the PowerShell command `Get-NetAdapterHardwareInfo` to check whether the NIC uses the correct PCIe link speed and width.

- In systems with more than one NUMA (non-uniform memory access) node, the interconnect between the nodes can become a bottleneck. We recommend you to optimize the settings as suggested by the CPU and NIC manufacturer. If possible, lock the host software to the NUMA node connected to the NIC.

NIC driver settings under Linux

Receive buffer size

You can increase the receive buffer size to handle the data throughput

- Temporarily: `sysctl -w net.core.rmem_max=33554432`
- Permanently: Add to the file **/etc/sysctl.conf**:
  `net.core.rmem_max=33554432`

The following commands can be used to find suitable settings. Note that these settings are **only temporary**. Adjust the corresponding system configuration files to change the settings permanently.

- Enabling Jumbo frames by setting the MTU size:
  ifconfig <dev> mtu 16000
- Setting the IP address:
  ip a 169.254.240.4/16 dev <dev>
- Some 5GBASE-T NICs do not support auto negation.
  Setting the link speed manually:
  ethtool -s <dev> autoneg off speed 5000
- Enabling **Ethernet Flow Control**:
  ethtool -A <dev> tx on rx on
  ethtool -A <dev> autoneg on
  ethtool -r <dev>

NIC driver settings under Windows

- Maximize the Jumbo Frame size.
- Maximize the number of receive buffers.
- Switch off all non-required drivers, including filter drivers, in the network adapter settings. Mostly, the GigE filter driver included in **Vimba X** helps to increase the performance. Be aware that using a PCAP filter, such as **Wireshark**, has an impact on the performance.
- Optimize settings related to IRQs (interrupt requests) in the network driver settings (interrupt moderation).
- RSS (receive side scaling) should be enabled to improve the performance when multiple cameras or several network adapters are connected to the host.
- Enable **Ethernet Flow Control** for Rx and Tx traffic.

If Vimba and Vimba X are installed on the same PC

If you have installed **Vimba** and **Vimba X** on the same PC, see the Vimba X for Windows Release Notes to avoid issues with the GigE filter driver.

Connecting to the host computer

Use a Category 6 or higher rated Ethernet cable to connect the Goldeye Pro G5 camera to the NIC. Crossover cabling is not required but does work. The camera has circuitry to determine if a crossover cable is being used.

We recommend Category 6 (CAT6) or higher rated Ethernet cables for Goldeye Pro G5 cameras. A different rating may not sustain peak interface bandwidth; leading to lost connectivity or dropped frames coming from the camera.

After you have installed **Vimba X**, including **Vimba X Viewer** or a third-party application to your host computer, connect your Goldeye Pro G5 camera via an Ethernet cable. If your camera is not PoE powered, connect the Hirose I/O cable to power the camera.

Configuring IP settings

Examples for IP settings

See Setting IP addresses on page 90 for details.

1. Open **Vimba X Viewer**.
2. Click **IP** (a) to open the **IP Widget**.
   The window of the IP Widget opens.
3. Select the camera (b) to be configured.
4. In the IP Widget, select **Persistent IP** (c).
5. Enter IP address settings (d).
6. Click **Write** (e) to apply settings for the camera.

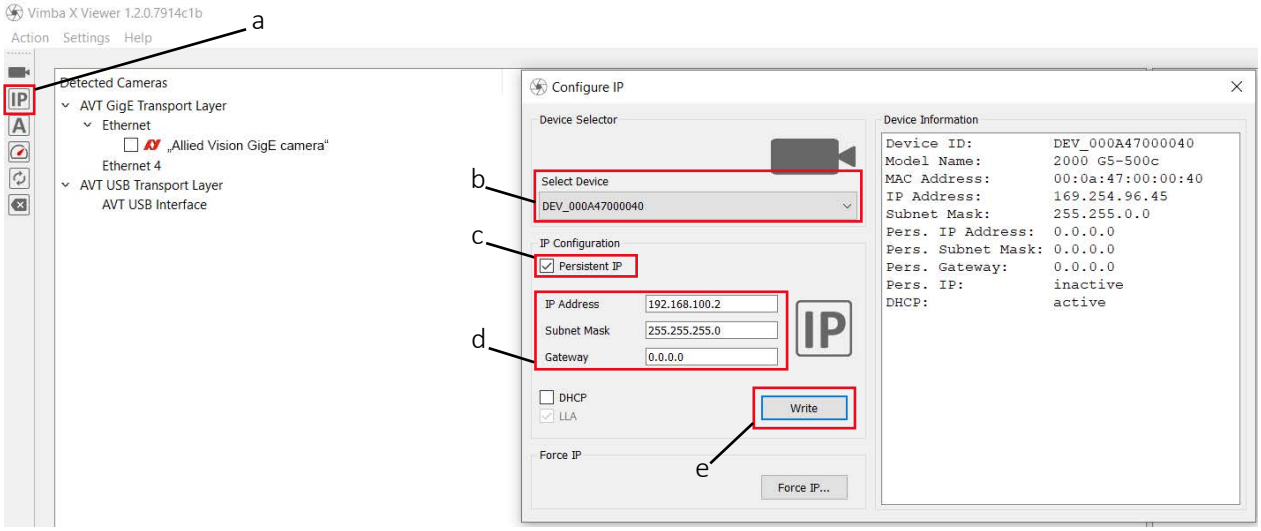


Figure 18: Configuring IP settings with the IP Widget of Vimba X Viewer

7. Restart the camera.

The camera is not recognized

Of course, the camera will not be recognized any more until you have changed system IP settings in step 9.

8. Continue for the other cameras from step 2. to 7.
9. Change system IP settings.

Setting IP addresses

After the initial NIC hardware installation, connect the NIC directly to the camera. The default configuration assigns an IP address automatically using the LLA (Link-Local Address) range of 169.254.xxx.xxx or an address defined by the DHCP (Dynamic Host Configuration Protocol) server, if present. This setup is a typical solution for single-camera operation or multiple cameras connected to the same NIC.

If you are going to operate multiple cameras on different networks, you can use the following configuration as a template.

All network devices (such as NICs, switches, or GigE cameras) require unique IP addresses. But connected devices must share the same subnet.

In the example shown in Table 47, 3 cameras are connected to a common host PC, using 2 separate NICs. The subnet for NIC 1 is 192.168.**100**, for NIC 2 it is 192.168.**101**:

Device	IP address	Subnet mask	Default gateway
NIC 1	192.168.100.1	255.255.255.0	Blank
Camera 1 connected to NIC 1	192.168.100.2	255.255.255.0	Blank
NIC 2	192.168.101.1	255.255.255.0	Blank
Camera 2 connected to NIC 2	192.168.101.2	255.255.255.0	Blank
Camera 3 connected to NIC 2	192.168.101.3	255.255.255.0	Blank

Table 47: Static IP addresses for NICs and connected cameras

Applying advanced IP settings for cameras

See Configuring IP settings on page 89 for instructions.

Software for your Goldeye Pro G5

Allied Vision software

Software packages provided by Allied Vision are free of charge and consist of:

- Drivers
- SDK for camera control and image acquisition
- Examples based on the provided APIs of the SDK
- Documentation and release notes
- Viewer application to operate and configure the cameras

Download **Vimba X** from www.alliedvision.com/en/products/software/vimba-x-sdk. After installing, documentation is located in the **Vimba X** program folder.

Third-party software

In addition to the software provided by Allied Vision, numerous GigE Vision Standard compliant third-party software options can be used to extend functionalities, such as image processing and video recording.

Allied Vision's **Vimba X** is based on the GenICam standard. GenICam-based third-party software automatically connects with Vimba's transport layers.

Cognex VisionPro

Previous **Vimba** includes the **Cognex Adapter** to support **Cognex VisionPro**. For **Vimba X**, you can download **Vimba X Cognex Adapter** from www.alliedvision.com/en/support/software-downloads as a separate software.

Temperature control

This chapter includes:

Precautions

CAUTION

Risk of burns

A camera in operation can reach temperature levels which could cause burns.

- Wear protective gloves when you touch a camera that is heated up.
- Ensure proper cooling of the camera.
- See Providing optimum heat dissipation on page 34.

NOTICE

RCG models: Damage to the sensor

For Goldeye Pro G5 cameras with RCG (Removed Cover Glass) sensor option, condensation can cause short circuits on the sensor.

- During operation, avoid condensation of humidity on the sensor.
- Set the `SensorTemperatureSetpointMode` feature to *`Manual`* (default), avoid using *`Auto`* mode.
- Set all values for `SensorTemperatureSetpointValue` carefully.
- Observe the description in the Handling Cameras with RCG and TCG Options application note, see the note below.

NOTICE

Long-term sensor damage

If InGaAs sensors are operated at the upper temperature limit specified for a long time, permanent damage occurs: The image quality is degraded by an increased dark current and pixels defects are added.

- Ensure the sensor is properly cooled.
- If you are in doubt, keep `SensorTemperatureSetpointMode` in *`Auto`* status.

How temperature affects the sensor

During operation, the electronics heat up the camera interior and housing. InGaAs sensors are affected by temperature by:

Absolute level of sensor temperature

An increase in sensor temperature reduces the image quality, because:

- An increased sensor temperature **increases the dark current** of the FPA's photo-diodes, thus **decreasing the dynamic range** of the camera. As a rule of thumb, a temperature increase of 8 Kelvin doubles the dark current. The dark current produces **additional offset and 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.

Fluctuation of sensor temperature

A fluctuation in sensor temperature creates the effects described above, but with changing values.

TEC (Thermo-electric cooling)

TEC can be used to compensate for effects caused by high or fluctuating sensor temperature. This chapter describes how temperature control is realized in Goldeye Pro G5.

For sensors with TEC element, the Goldeye Pro G5 provides temperature stabilization at one of several temperature setpoints (factory or user settings).

Heat dissipative housing

The Goldeye Pro G5 housing is optimized so that the heat is dissipated and released into the environment.

Stabilizing the sensor temperature

After switching on the camera, the TEC element stabilizes the sensor temperature at the default setpoint, if possible. Goldeye Pro G5 cameras typically need approximately 20 seconds to stabilize the sensor temperature to 20 °C. Consider that during this period, the image quality may be slightly reduced.

The camera's TEC element can stabilize the sensor temperature by:

- **Cooling** is typically used when the ambient temperature is greater than the desired sensor temperature.
- **Heating** is used to reduce the warm-up period of the sensor at ambient temperatures below 0 °C.

The temperature status LED signals the TEC controller status.
See Camera temperature status LED on page 98 for details

Use a heat sink to reduce camera temperature

To improve the cooling of Goldeye Pro G5 models, a heat sink kit is available that you can mount to the camera. Up to four heat sinks can be fitted to one camera.

For more information, see the Goldeye G/CL, Goldeye Pro G5 Heat Sink Kit User Guide at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Neutralization of the temperature influence

The TEC element keeps the sensor temperature at predefined setpoints to control the temperature influence on non-uniformity.

Temperature setpoints

Correction data is applied to the output signal. Individual correction datasets are uploaded to the camera during manufacturing according to the corresponding model.

Goldeye Pro	Setpoint 1	Setpoint 2	Setpoint 3	Setpoint 4
G5-130 VSWIR TEC1	+5 °C	(Default) +20 °C	+35 °C	+50 °C
G5-320 VSWIR TEC1				
G5-530 VSWIR TEC1				

Table 48: Defined temperature setpoints for Goldeye Pro G5 cameras

Achievable temperature difference

The ability for cooling and heating of the Goldeye Pro G5 is limited. Therefore, the temperature difference (ΔT) achievable by the TEC element is limited as well. Table 49 displays the maximum ΔT maintained and the resulting power consumption by model.

The actual maximum ΔT depends on environmental conditions, Peltier element, heat sinks, and heat sources. Heat sources are in particular the camera electronics and the Peltier element itself.

Due to changing environmental conditions, it is not always necessary for the TEC element to maintain the maximum ΔT. On the other hand, particular environmental conditions allow the TEC element to achieve an even higher ΔT.

Note that for sensor cooling the TEC element dissipates heat into the camera.

Goldeye Pro	Maximum ΔT* Between housing and FPA	Maximum power To reach ΔT
G5-130 VSWIR TEC1	30 K	< 5.5 W
G5-320 VSWIR TEC1		
G5-530 VSWIR TEC1		
*Typical value		

Table 49: Cooling limits for Goldeye Pro G5 cameras

Temperature measurement

To control the internal camera temperature, 4 temperature sensors are available in the camera. Use the `DeviceTemperatureSelector` to select between these sensors, as listed in Table 50.

`DeviceTemperature` displays the temperature measured by the selected sensor.

Values	Temperature sensor location
`Phy`	On the physical layer chip
`Sensor`	Typically inside the image sensor (default value)
`Sensorboard`	On the image sensor board
`Mainboard`	On the main board

Table 50: DeviceTemperatureSelector values

Switching between temperature setpoints

If the internal temperature exceeds the Alert limit:

- The image sensor and the cooling are shut down.
- The camera is still powered.
- After the camera has cooled down sufficiently, you may bring it back to normal operation: Switch the power supply off and switch it on again.

The Goldeye Pro G5 temperature control allows switching between setpoints manually or automatically. In *`Auto`* mode, the TEC controller switches up or down to the next setpoint, depending on the temperature inside the camera.

Conditions for changing setpoints

The TEC controller does not switch up or down immediately after reaching the next setpoint. Switching only takes place when the temperature deviates from the setpoint temperature by a few degrees.

Switching to higher setpoints

After powering up, the camera temperature rises because the camera generates heat itself. A warm ambient temperature can further heat up the camera. The TEC controller stabilizes the sensor temperature to a predefined temperature setpoint (see Table 48 on page 95).

As long as the difference between sensor temperature and housing temperature does not exceed the maximum ΔT (see Table 49 on page 96), the TEC controller keeps the sensor temperature.

If the difference between sensor temperature and housing temperature exceeds the maximum ΔT, the TEC element can no longer keep the sensor temperature at the current setpoint: The TEC controller switches up to the next higher setpoint.

Switching to lower setpoints

When the ambient temperature decreases, this causes the camera temperature to decrease as well. With further temperature decrease, the sensor temperature can fall below the current setpoint temperature. The TEC element is not needed any longer to cool the sensor to the adjusted temperature setpoint.

To avoid that the sensor temperature becomes unstable, the TEC controller switches down to the next lower setpoint, before ΔT becomes too small to compensate for.

Conditions for changing setpoints

The TEC controller does not switch up or down immediately after reaching the next setpoint. Switching only takes place when the temperature deviates from the setpoint temperature by a few degrees.

Switching off the sensor

If the internal camera temperature exceeds the specified **emergency shutdown temperature** (see Goldeye Pro G5 model specifications on page 47), the camera's overheat protection circuit powers down the sensor and the TEC element.

Camera temperature status LED

Table 51 describes the operational states indicated by the temperature status LED on the camera back panel (see Back panel on page 101).

NOTICE

Long-term sensor damage

If InGaAs sensors are operated at the upper limit specified for a long time, permanent damage occurs: The image quality is degraded by an increased dark current and pixels defects are added.

- Ensure the sensor is properly cooled.
- In doubt, keep `SensorTemperatureSetpointMode` in *`Auto`* status.

Ensure sufficient heat dissipation

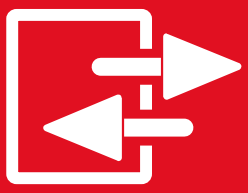
If the camera has switched to **Alert** status, we recommend you to improve heat dissipation for the camera housing before resuming operation.
See Providing optimum heat dissipation on page 34.

LED code	Feature status[1]	Description
Inactive	*`Off`*	The TEC element has actively been switched off by `SensorTemperatureControlMode`.
Red Green Flashing	*`Deviated`*	The defined setpoint has not been stabilized yet. (This is no error signal.)
Green Continuous	*`Stable`*	The defined setpoint has been stabilized, the camera operates optimally.
Red Flashing	*`UpperLimit`* or *`LowerLimit`*	• The TEC control operates at its upper or lower power limit. • The TEC element cannot keep the setpoint. • The image correction quality may get worse.
Red Continuous	*`Alert`*	• The TEC element (and the sensor) are shut down. See Goldeye Pro G5 model specifications on page 47. • This LED code does not change even when the camera has cooled down again. • **After the camera has cooled down sufficiently**: Apply `DeviceReset` or repower the camera.
Red Flashing	*`Error`*	• The TEC control is in a non-functional state. • Please contact The Allied Vision support team at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

[1] This value is output by `SensorTemperatureControlState`.

Table 51: Temperature status LED

Camera interfaces



This chapter includes:

Precautions

NOTICE

Damage to the camera by exceeding the maximum input voltage

Apply a maximum input voltage of 26.4 VDC.

NOTICE

Damage to the camera by surge

ESD by improper grounding can damage the camera.

- Ensure proper grounding.
- Follow the instructions in ESD on page 35.

NOTICE

Damage to the camera by reverse polarity

If Goldeye Pro G5 cameras are externally powered with reverse polarity, the cameras can be damaged.

Power Goldeye Pro G5 cameras according to the specifications described in this chapter.

Avoid electromagnetic interferences

For all power and interface connections, use only shielded cables.

I/O cables maximum length

The maximum length for I/O cables must not exceed 30 m.

Note: Contents in this note are under construction.

Signal level

Consider this when you connect external devices to your camera, for example, to trigger lighting:

- The default signal level for isolated outputs is low at camera startup.
- The default signal level for non-isolated I/Os is low at camera startup.

Use the `LineInverter` feature to configure I/O polarity to your needs.

Back panel

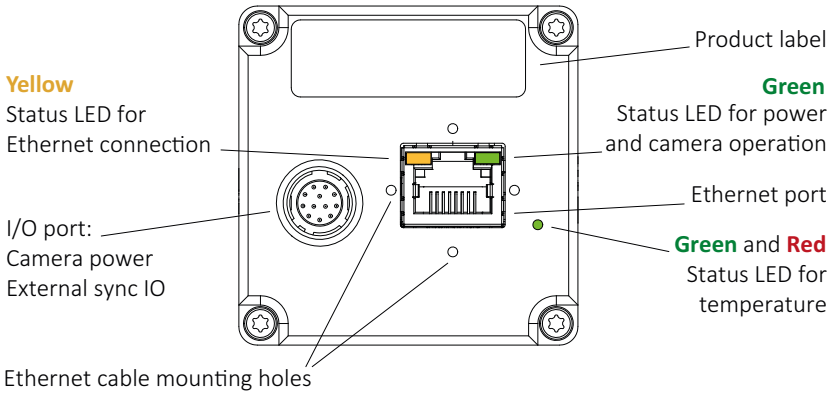


Figure 19: Back panel view

Figure 19 shows the status LEDs:

- Two LEDs at the RJ45/8P8C port display the status of
  - Ethernet connection
  - Power and camera operation.

  See Ethernet and power status LEDs on page 110 for details.
- One temperature status LED showing the sensor and camera temperature status.
  See Camera temperature status LED on page 98 for details.
  For temperature management, see Temperature control on page 92.

Power supply

Consider that Goldeye Pro G5 cameras do not work in reverse polarity. See I/O connector pin assignment on page 103 for more information. When cameras are powered by both the Hirose I/O port and by PoE, the power of the I/O port is used.

Ensure correct power connection

The DC port is not intended to be connected to a DC distribution network.

External power	PoE
Through 12-pin Hirose I/O port • Pin 1, External GND • Pin 2, External Power	Through the Ethernet port by **PoE (IEEE 802.3at Type 1, Class 0)** supported NIC, switch, or injector

Table 52: Differences between external power and PoE

Power supply via I/O connector

Use one of the following connections.

- Power supply with 12-pin Hirose connector
- I/O cable with 12-pin Hirose connector in conjunction with a standard power supply adapter

Ensure a correct power supply

If the camera is provided with power via the I/O connector, always ensure that the voltage at the camera input is in the defined range of 12 to 24 VDC (±10%).

Power supply via Ethernet connector

You can supply Goldeye Pro G5 models 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 5GBASE-T), which supports cable lengths of up to 100 meters. All Goldeye Pro G5 models can obtain power from IEEE 802.3at Type 1, Class 0 compliant Power Sourcing Equipment (PSE) devices, such as switches, injectors, or NICs.

Minimizing Power consumption

If the camera operates under higher temperature conditions, you should consider powering the camera via the I/O connector instead of PoE, because PoE contributes to the heat build-up inside the camera.

Refer to Goldeye Pro G5 model specifications on page 47 for details on power consumption.

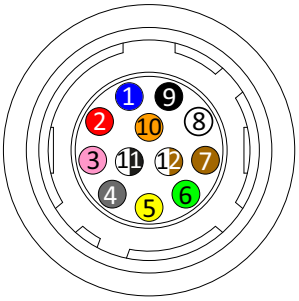
I/O lines: Direction and type

The I/O lines are organized in groups:

Type	Opto-isolated				LVTTL			
Direction	**Output**			**Input**	**Bidirectional**			
Line	Line0	Line1	Line2	Line3	Line4	Line5	Line6	Line7

Table 53: I/O lines | Direction and type

I/O connector pin assignment



I/O connectors and cables

The color coding refers to I/O cables offered by Allied Vision.

Camera I/O connector: Hirose HR10A-10R-12PB(71)

Cable I/O connector: Hirose HR10A-10P-12S(73)

Pin	Color code		Signal	I/O	Level	Description
1	Blue		External GND	—	0 VDC	Ext. ground for LVTTL I/Os and external power
2	Red		External Power	In	12 to 24 VDC (±10%)	Power supply
3	Violet		Line0	Out	Open emitter, maximum 20 mA	Opto-isolated
4	Gray		Line7	In/Out	V_{in} (low) = -0.3 to 0.8 VDC V_{in} (high) = 2.0 to 5.5 VDC V_{out} (low) = 0 to 0.4 VDC V_{out} (high) = 2.2 to 3.3 VDC at max. 20 mA	Non-isolated (LVTTL)
5	Yellow		Line1	Out	See Line0	
6	Green		Line4	In/Out	See Line7	
7	Brown		Isolated In GND	—	0 VDC	Common GND for opto-isolated inputs
8	White		Line6	In/Out	See Line7	
9	Black		Line5	In/Out	See Line7	
10	Orange		Isolated Out Power	In	Common supply voltage for outputs max. 30 VDC	External power input for opto-isolated outputs (Out V_{CC})
11	White/ Black		Line3	In	V_{in}(high) = 3.0 to 24.0 VDC [1] V_{in}(low) = 0 to 1.0 VDC	Opto-isolated
12	White/ Brown		Line2	Out	See Line0	
Shell	Braid	X	Chassis GND	—	0 VDC	Chassis ground

[1] For >24.0 to 36 VDC, connect a 3.3 kΩ external resistor in series.

Table 54: Pin assignment for 12-pin Hirose connector

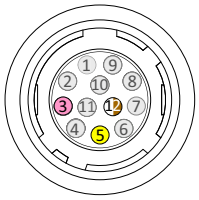
I/O description

Opto-isolated output

Output signals can be assigned to various internal camera signals via software. See Selecting signals for output on page 109.

Line0, Line1, Line2

Line0 (pin 3), **Line1** (pin 5), and **Line2** (pin 12) signals are opto-isolated outputs that can be used in electrically noisy environments to prevent false trigger events. They require the user to provide a voltage level at **Isolated Out Power** (pin 10).



An example of the functional circuit is indicated in Figure 20 on page 104.

Signal	Output voltage and current
Source voltage for Isolated Out Power	3 to 30 VDC
Maximum output current per output	20 mA

Table 55: Line0, Line1, Line2 output voltage source and current per channel

Possible low output voltage

Output voltage may drop **by approximately 2.5 VDC** under full load.

Line0, Line1, Line2 output block diagram

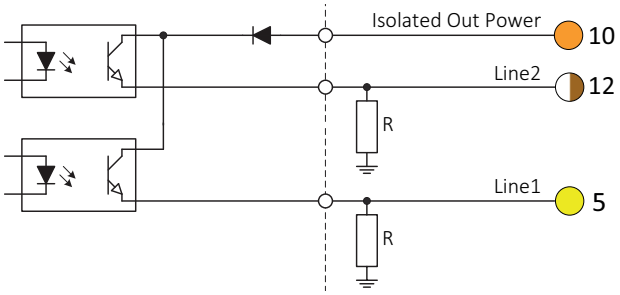


Figure 20: Line0, Line1, Line2 opto-isolated output block diagram

Isolated Out Power	Resistor value
5 VDC	1.0 kΩ
12 VDC	2.4 kΩ
24 VDC	4.7 kΩ

Table 56: Isolated Out Power and value of the external resistor

Line0, Line1, Line2 output delay

The output switching times in Figure 21 apply to opto-isolated outputs only.

Note that higher external resistor values increase the values listed in Table 57.

Variable	Timing parameter	Timing value
t_d	Delay time	~1 µs
t_r	Rise time	~1 µs
$t_{on} = t_d + t_r$	Turn-on time	~2µs
t_s	Storage time	~26 µs
t_f	Fall time	~21 µs
$t_{off} = t_s + t_f$	Turn-off time	~47 µs

Table 57: Line0, Line1, Line2 output parameters and values

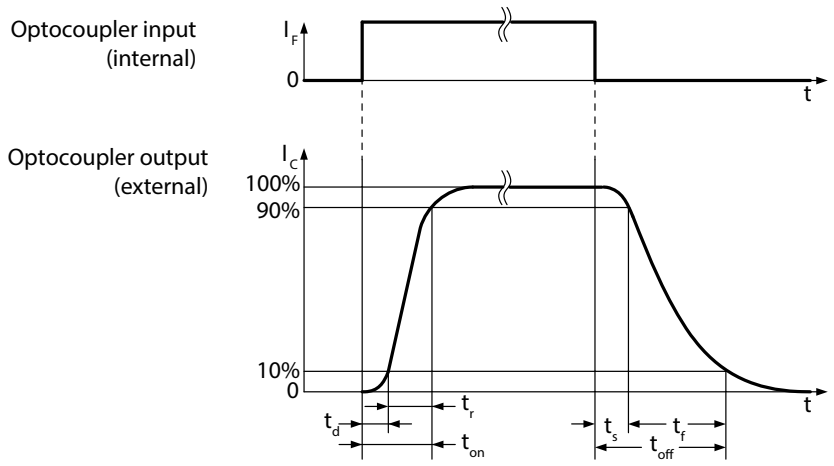


Figure 21: Line0, Line1, Line2 output switching times

Cycle delay

The cycle delay for the Goldeye Pro G5 is as follows:

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

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

Test conditions

- External 2.4 kΩ resistor to GND
- Power input for output ports set to 12 VDC

Opto-isolated input

Input signals allow the camera to be synchronized to an external event.

Line3

Line3 (pin 11) signal is an opto-isolated input that can be used in electrically noisy environments to prevent false trigger events.

To complete the trigger circuit, connect trigger ground to **Isolated In GND** (pin 7).

Compared to the non-isolated trigger, **Line3** has a longer propagation time.

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

Table 58: Line3 trigger signal and input current

Line3 input block diagram

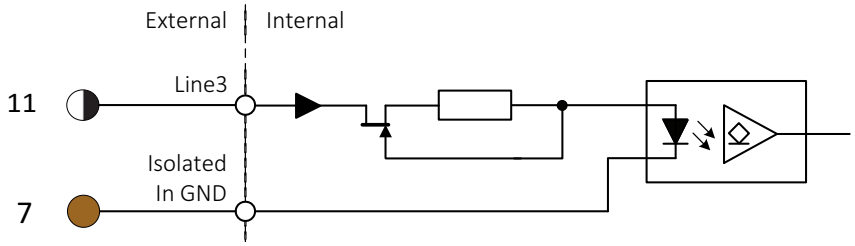


Figure 22: Line3 input block diagram

The input can be connected directly to the system for voltages up to 26.4 VDC. An external resistor is not necessary.

Line3 input delay and minimum pulse width

The minimum pulse width for all Goldeye Pro G5 cameras is:

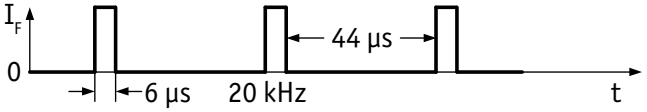


Figure 23: Line3 input minimum pulse width

Bidirectional LVTTL signals

Non-isolated lines versus opto-isolated lines

Because non-isolated lines have a high-impedance and are referenced to the camera ground, they should be used with short cable lengths only.

Whenever the timing disadvantages of the opto-isolated lines can be neglected or compensated for, they should be preferred. They are electrically more robust and allow for higher voltages to reduce the influence of electromagnetic disturbances.

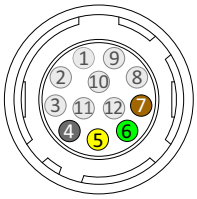
Input signals allow the camera to be synchronized to an external event. The camera can be programmed to trigger on the rising edge, falling edge, both edges, or level of the signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

Output signals can be assigned to a variety of internal camera signals via software. See Selecting signals for output on page 109 for more information.

Line4, Line5, Line6, Line7

Line4 (pin 6), **Line5** (pin 9), **Line6** (pin 8), and **Line7** (pin 4) signals can be used as a non-isolated inputs or outputs when environmental electrical noise is inconsequential, and faster trigger response is required.

Connect signal ground to **External GND** (pin 1) to complete the external circuit.



Signal	Output
Output signal	LVTTL (3.3 VDC)
Maximum output current	20 mA

Table 59: Line4, Line5, Line6, Line7 output signal and maximum current

Possible low output voltage

Output voltage may drop **down to approximately 2.2 VDC** under full load.

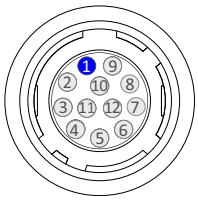
Trigger signal	Input voltage and current
Required trigger signal	LVTTL (3.3 VDC), TTL (5 VDC) tolerated
Input current to be expected in TTL mode	0.3 mA
Input current to be expected in LVTTL mode	0.3 mA

Table 60: Line4, Line5, Line6, Line7 input trigger signal and input current

Power and ground

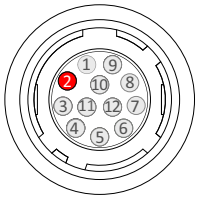
External GND

Connect **External GND** (pin 1) for non-isolated I/Os and external power.



External Power

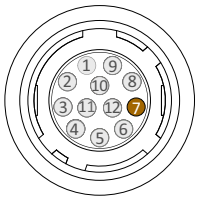
Connect **External Power** (pin 2) to power the camera externally.



Isolated In GND

Connect **Isolated In GND** (pin 7) for the opto-isolated input.

These lines can be used in electrically noisy environments to prevent false trigger events.



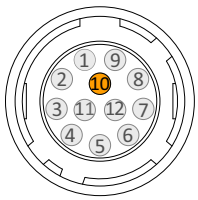
Isolated Out Power

Connect the **Isolated Out Power** (pin 10) to a power source for opto-isolated output signals **Line1** (pin 5) and **Line2** (pin 12).

These lines can be used in electrically noisy environments to prevent false trigger events.

The voltage requirement is 3 to 30 VDC. 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 **Line1** and **Line2** wiring to prevent parasitic coupling.



Selecting signals for output

Output signals can be assigned to a variety of internal camera signals via software.

Figure 24 shows an example where Line4 ❶ is enabled ❷ to output ❸ a signal when the camera is ready to receive triggers ❺, the signal level is not inverted ❹:

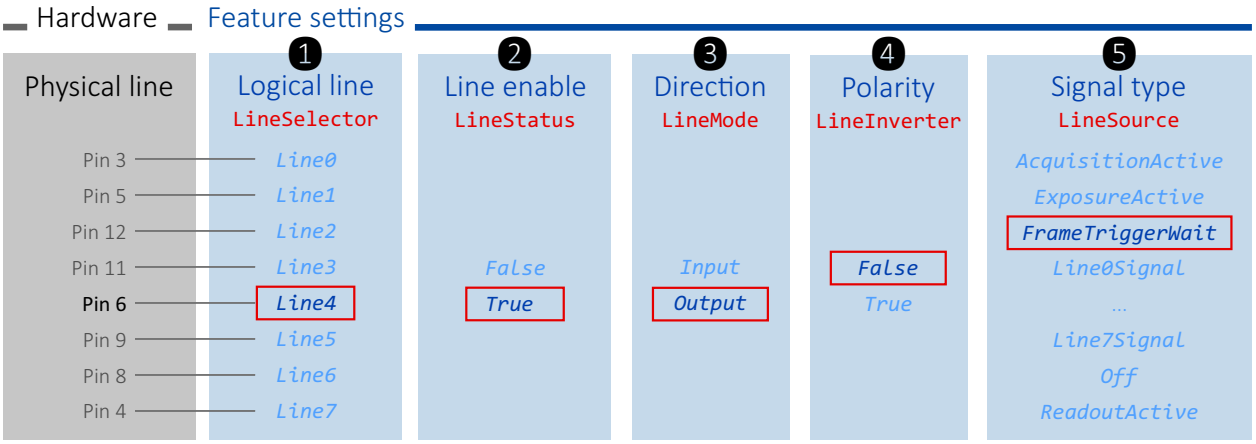


Figure 24: Example > Feature settings for Line4

Table 61 shows options available for `LineSource`:

Values	Output signal
AcquisitionActive	The camera is ready to expose images.
ExposureActive	The camera is exposing an image.
FrameTriggerWait	The camera is waiting for a trigger. In fixed frame rate or freerun mode, the signal for *FrameTriggerWait* is low.
Line0Signal	The Line0 signal is output.
... Line1 to Line6 correspondingly	
Line7Signal	The Line7 signal is output.
Off	No signal is output.
ReadoutActive	The camera is reading out an image.

Table 61: Options for LineSource

Input signals can be configured correspondingly.

Using I/Os by firmware features

For feature descriptions, see the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Ethernet and power status LEDs

Temperature LED

See Camera temperature status LED on page 98 for a description.

LED	LED code	Status
Green	Inactive	The camera is not powered.
Yellow	Inactive	The camera is not connected to an Ethernet adapter.
Green	 Continuous	The link to the host has been established.
Yellow	 Flashing	Ethernet activity
Green Yellow	 Flashing synchronously	The camera is booting.
Green Yellow	 Flashing alternately	Firmware update in progress. **Do not power cycle the camera!** See Firmware update on page 121.

Table 62: Ethernet and power status LEDs

Triggering and timings

This chapter includes:

Trigger timing diagram

The diagram in Figure 25 explains the trigger concept in general.

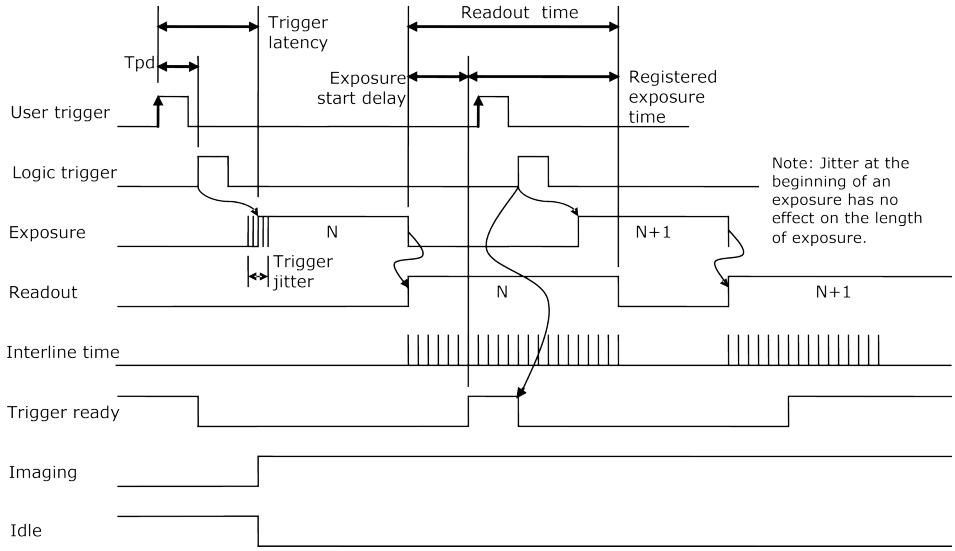


Figure 25: Goldeye Pro G5 trigger timing diagram

Feature descriptions

For the Goldeye Pro Features Reference, see www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

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	Statistical deviation from the typical 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	= Readout time – registered exposure time. This value indicates when the next exposure cycle can begin after the current readout.
Interline time	Time between sensor row readout cycles.
Imaging	High when the image sensor is exposing and/or reading out data.
Idle	High when the image sensor is not exposing and/or reading out data.

Table 63: Goldeye Pro G5 trigger definitions

Trigger rules

Triggering GigE cameras

For a more detailed description of the trigger concept for advanced users and special scenarios, see www.alliedvision.com/en/support/faqs-application-notes: Triggering Concept for Allied Vision GigE Cameras.

1. Set **User Trigger pulse width** ≥ 3 × Trigger Latency width.
2. The **end of exposure** always triggers the next Readout.
3. The **end of exposure** must always end after the current Readout.
4. The **start of exposure** must correspond with the Interline Time during readout.
5. **Exposure Start Delay** = Readout Time — Registered Exposure Time.

Trigger latencies and jitter

Trigger timings

Measured was the delay between the rising edges of an external trigger signal at an I/O line and the `ExposureActive` signal.

Values in Table 64 are based on the following data:

- Absolute latency depends on the value for `SensorBitDepth`.
- Opto-isolated inputs add a constant delay depending on the camera model and ambient temperature.

Line	Type	Direction	Parameter	Notes	Delay by `SensorBitDepth` value[1]	
					10-bit	12-bit
Line0, Line1, Line2	Opto-isolated	**Output**	Output lines cannot be used to trigger the camera.			
Line3	Opto-isolated	Input	Trigger latency	Offset to Line7: max. +3.5 µs	11.2 to 22.9 µs *15.5 to 26.1 µs*	20.0 to 37.1 µs *26.4 to 43.0 µs*
			Trigger jitter	Variation (included in latency values)	±7.6 µs *±7.5 µs*	±13.6 µs *±13.1 µs*
Line4, Line5, Line6, Line7	Non-isolated	Bidirectional	Trigger latency	N.a.	11.2 to 19.4 µs *15.5 to 22.6 µs*	20.0 to 33.6 µs *26.4 to 39.5 µs*
			Trigger jitter	Variation (included in latency values)	±7.6 µs *±7.5 µs*	±13.6 µs *±13.1 µs*

[1]Values in regular font: Pro G5-320/530 VSWIR TEC1, Values in *italics*: Pro G5-130 VSWIR TEC1

Table 64: Trigger timings for Goldeye Pro G5

Overtriggering

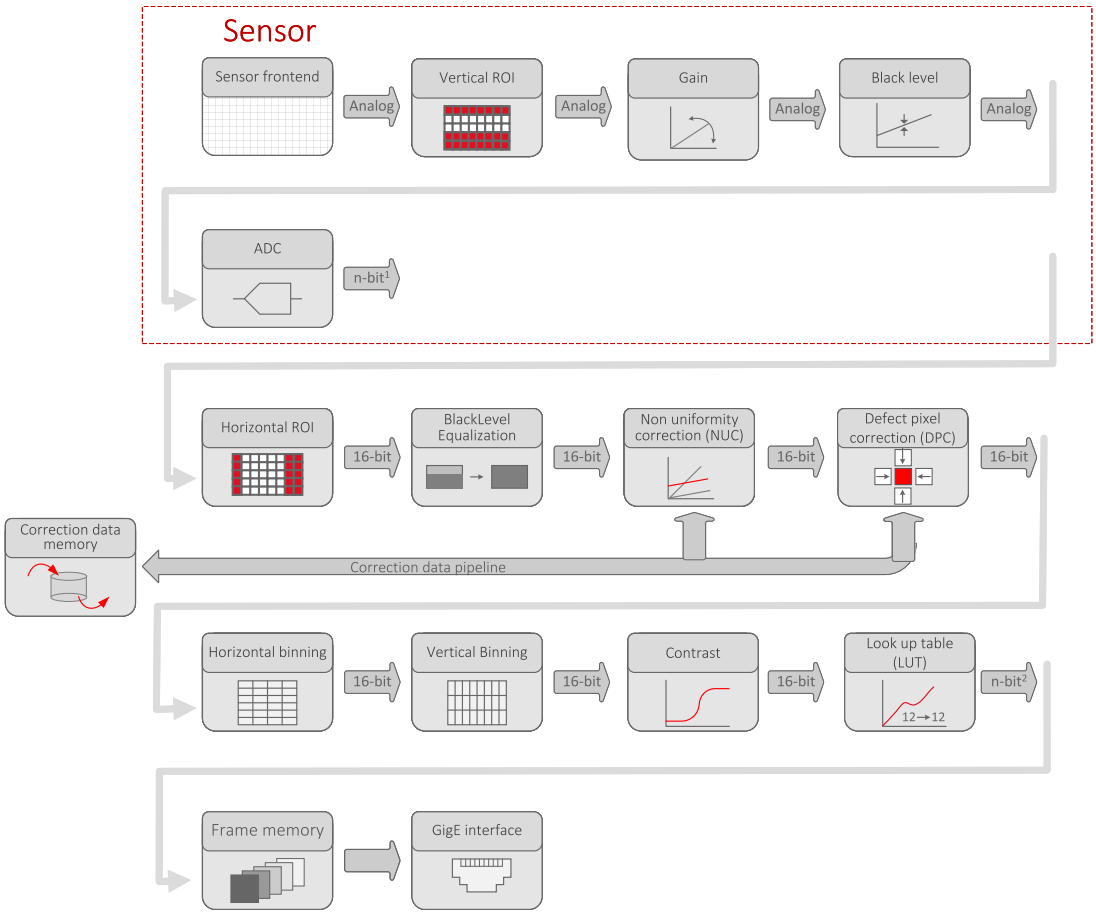
With external triggering, dropped frames can occur. Avoid overtriggering and select values for image acquisition that are supported by the bandwidth of the host.

Image data flow

This chapter includes:

Image data flow diagram

Figure 26 shows the order in which the features are processed in Goldeye Pro G5 cameras.



[1] Model dependent: See ADC bit depths in Goldeye Pro G5 model specifications on page 47.

[2] Depending on the selected pixel format.

Figure 26: Image data flow of Goldeye Pro G5 cameras

Feature descriptions and firmware downloads

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Firmware downloads: www.alliedvision.com/en/support/firmware-downloads.

Image corrections

Image corrections are vital for the image quality of Goldeye Pro G5 cameras:

- Defect pixel correction (DPC) on page 117
- Non-uniformity correction (NUC) on page 118.

Feature descriptions for DPC and NUC

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Conditions of exposure

Correction datasets are assigned to typical parameters sets for:

- Analog gain setting
- Sensor temperature
- Exposure time.

Defect pixel correction (DPC)

Every sensor includes a number of defective pixels. A pixel defect has a response that deviates more than a specified value from the local background in a dark image, corrected gray image, or a saturated image. 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. Vision applications' requirements are typically much higher than the pixel defects allowed by sensor manufacturers. Therefore, Allied Vision's definition for pixel defects is stricter.

Pixel defects manifest due to defects in design of the semiconductor chip or manufacturing errors. They develop through the sensor's product life cycle. This aging is particularly caused by cosmic radiation, which is substantially increased during air transport, or by harsh operating conditions.

The Defect pixel correction (DPC) improves sensor quality above the standard typically provided by the sensor manufacturer. 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.

Goldeye Pro G5 is shipped with factory calibrated DPC datasets for different operating points (exposure time, gain, and temperature). To adjust the DPC to your own application, add individual datasets using the Defect Pixel Manager

Defect Pixel Manager

You can download the Defect Pixel Manager from www.alliedvision.com/en/support/software-downloads.

Non-uniformity correction (NUC)

Every pixel of an InGaAs sensor possesses its individual amount of dark signal. This results in the sensor's Dark signal non-uniformity (DSNU) and an individual sensitivity for light: The Photo response non-uniformity (PRNU). Therefore, each sensor creates a specific, non-uniform underlying pattern during exposure.

The non-uniformity correction (NUC) compensates for this pattern: Correction values for gain and offset of each pixel are determined based on multiple reference images and applied to the actual image. Ideally, no image structure is recognizable any more after corrections have been applied.

`NUCDatasetAuto` can be used to switch suitable datasets automatically when conditions change. No additional user interaction is necessary. In ***`Continuous`*** mode, the datasets are selected according to the current Conditions of exposure.

Image processing

Feature descriptions

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Binning

Binning reduces the image resolution by merging the gray values of adjacent pixels, but based on the full ROI. Different binning modes:

- ***`Average`*** can be used to reduce noise.
- ***`Sum`*** increases the sensitivity.

Black level

`BlackLevel` controls the DC offset applied to the video signal.

`BlackLevelAutoAdjust`

This feature cannot be used to control `BlackLevel`. It compensates for the drifting dark current depending on the exposure time and sensor temperature of Sony IMX InGaAs sensors.

BlackLevelEqualizationMode

For Goldeye Pro G5-130 VSWIR TEC1 operated in triggered mode and with `IntegrationMode` set to *`IWR`* (integrating during the readout), especially with short exposure times: Sensor characteristics cause the brightness to vary between the upper and lower part of the image.

`BlackLevelEqualizationMode` compensates for this inhomogeneous brightness between the sensor lines.

Note: For other sensor models, this error does not occur. For these models, the compensation is disabled by default.

Contrast

`Contrast` determines the ratio between the lightest and darkest regions of an image:

- **Increasing contrast** amplifies tonal differences by making bright pixels brighter and dark pixels darker.
- **Decreasing contrast** reduces the separation between tonal values. You can use this to reveal detail in shadow and highlight regions that might otherwise be clipped.

Gain

`Gain` multiplies current brightness values for a brighter output image:

Feature	Location	Available values	Unit	Supported models
`Gain`	Camera electronics	0 to 42 dB (float)	Decibel	All

Table 65: Gain values

Look-up table

The use of a look-up table allows any mapping function in the form
output = f(input)
to be applied to the pixel values at runtime.

The factory setting of Goldeye Pro G5 cameras includes LUT files with the corresponding datasets.

- 4 factory datasets: LUT_000 to LUT_003 files cannot be changed by the user.
- 4 user defined datasets: LUT_User_000 to LUT_User_003 files are empty for editing.

Loading data into the volatile LUT memory

Note that LUTs are loaded only from datasets including data.

1. Stop image acquisition.
2. Set `LUTEnable` to *`False`*.
3. Select the file to be loaded with `LUTDatasetSelector`.
4. Select the target LUT with `LUTSelector`.
5. Call the command `LUTDatasetLoad`.

Saving a LUT from volatile memory to file

1. Stop image acquisition
2. Set `LUTEnable` to *`False`*.
3. Select the LUT to be saved with `LUTSelector`
4. Select the target file with `LUTDatasetSelector`
5. Call the command `LUTDatasetSave.`

Firmware update

This chapter instructs on updating the firmware for Goldeye Pro G5 cameras.

Please note

You should update firmware only to change camera functions or fix known issues.

Consider: Any firmware update may not only add new features to a camera or fix known issues. It may also replace previous features or change camera characteristics. See firmware release notes for details.

Keep the camera connected

- Keep the camera and the computer running while you are executing a firmware update.
- If the camera is powered down during firmware update, it may get into a non-functional state. Recovery may not be possible.

Use only suitable firmware

If unsuitable firmware is used, the camera may get into a non-functional state.

- Only update to newer versions. Do not downgrade firmware to an older version, unless this has been explicitly communicated.
- We recommend updating the firmware to the next increment version only. Skipping versions may cause issues.

Firmware update with Vimba X

1. Download and install **Vimba X**.
   The download includes Vimba X documentation.
2. Download the firmware (AVF file).

Downloads

- For **Vimba X**, see www.alliedvision.com/en/products/software/vimba-x-sdk.
- For firmware updates, please contact your Allied Vision representative at www.alliedvision.com/en/avt-locations/avt-distributors.

3. Connect your Goldeye Pro G5 camera to the host.
4. Start the **Vimba X Firmware Updater**.
   The application window opens, displaying your camera and the installed firmware version.
5. Continue with Updating the firmware on page 123.

Updating the firmware

Screenshots

These instruction shows the firmware update on a **Windows** system. On **Windows** systems with other skins and on **Linux**, the GUI will look slightly different.

NOTICE

Damage to the camera by destroying the firmware

If the power connection is interrupted while updating the firmware, the camera can come into a non-functional state. In this case, the camera cannot be operated and you cannot update the firmware anymore.

- Keep the camera powered until firmware updates are completed and the camera reboot has been completed. (This can take up to 10 minutes.)
- **Do not** power cycle the camera while the LEDs toggle between **red**, **green**, and **yellow**.
- Follow the instructions below.

For issues with the firmware update, please contact Allied Vision Support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

The current firmware version is displayed.

1. Click **Open** to select the firmware for the update.

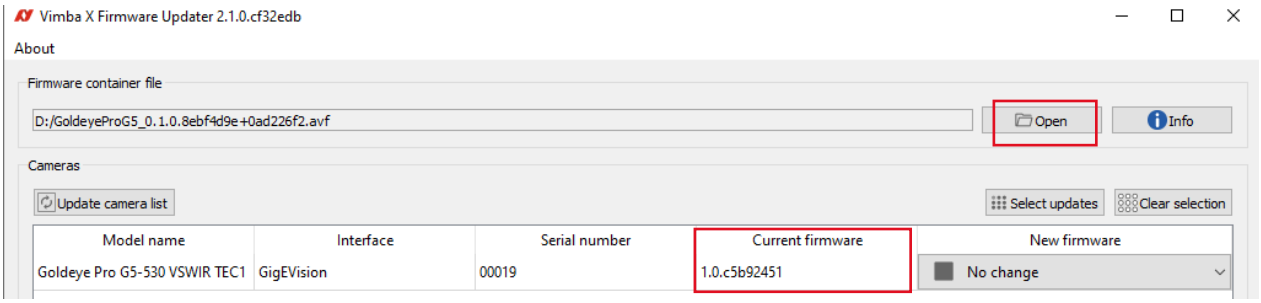


Figure 28: The camera and installed firmware are displayed

2. Select the firmware for the update from the drop-down menu.

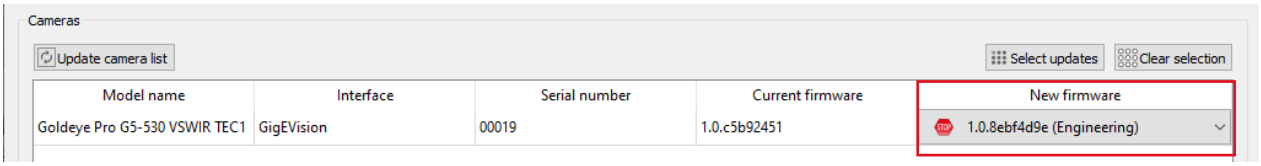


Figure 29: The firmware version is selected

3. Click **Update cameras**.

Figure 30: The update is being requested

NOTICE

Damage to the camera by destroying the firmware

If the power connection is interrupted while updating the firmware, the camera can come into a non-functional state. In this case, the camera cannot be operated and you cannot update the firmware anymore.

- Keep the camera powered until firmware updates are completed and the camera reboot has been completed. (This can take up to 10 minutes.)
- **Do not** power cycle the camera while the LEDs toggle between **red**, **green**, and **yellow**.

4. Click **OK** to confirm.

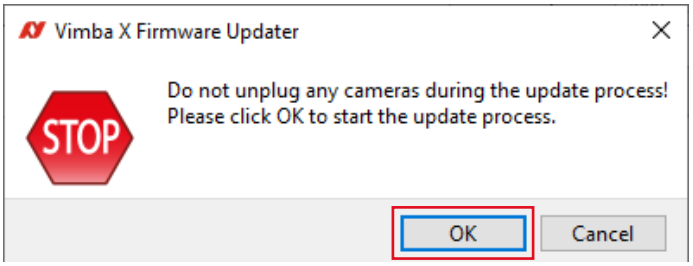


Figure 31: The update process is started

The update progress is displayed:

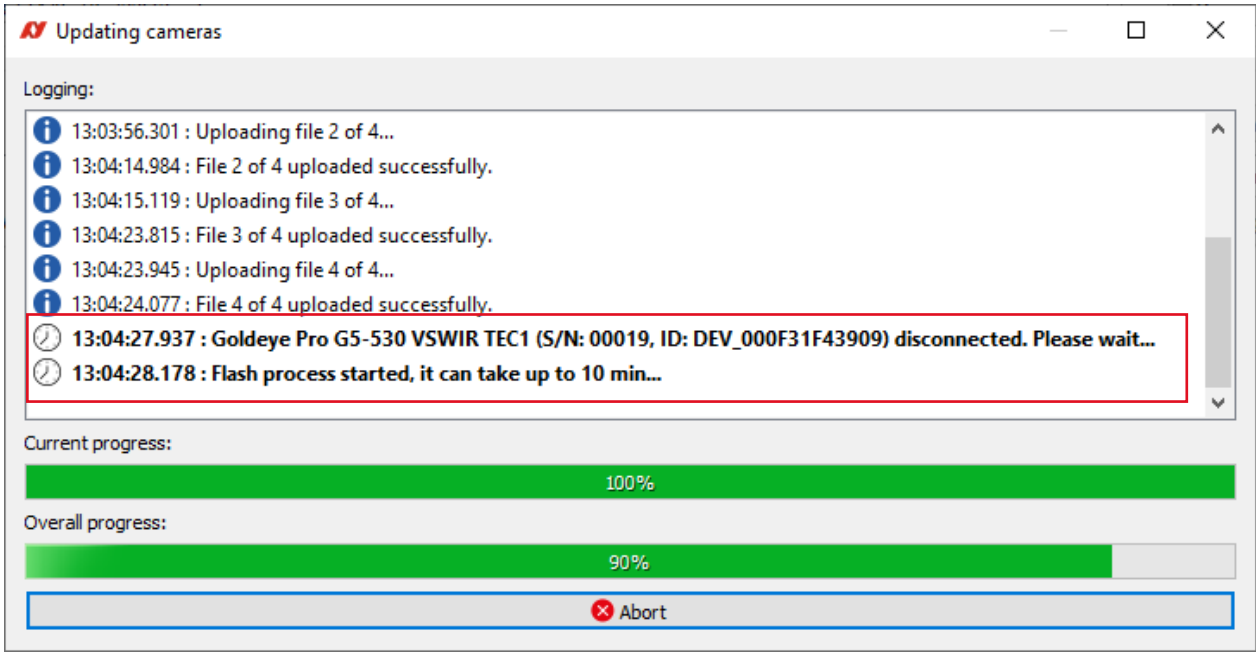


Figure 32: The update progress is displayed

The successful completion of the firmware update is displayed.
Process completed. 1 of 1 cameras updated successfully.

Click **Close** to confirm the completion of the update.

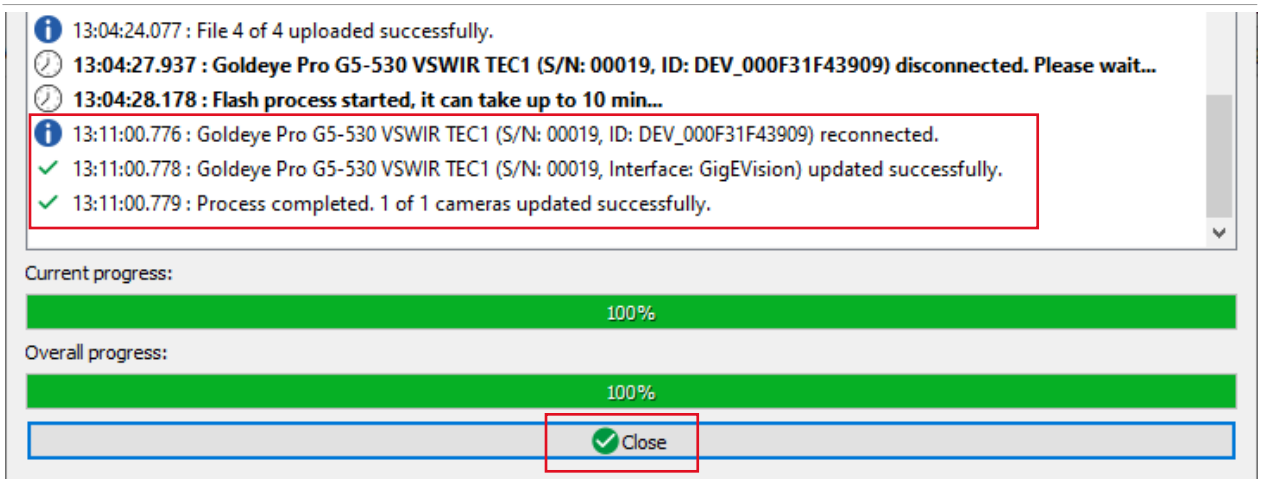


Figure 33: The update has been successfully completed

The popup window closes. In the main window, the current firmware version is displayed.

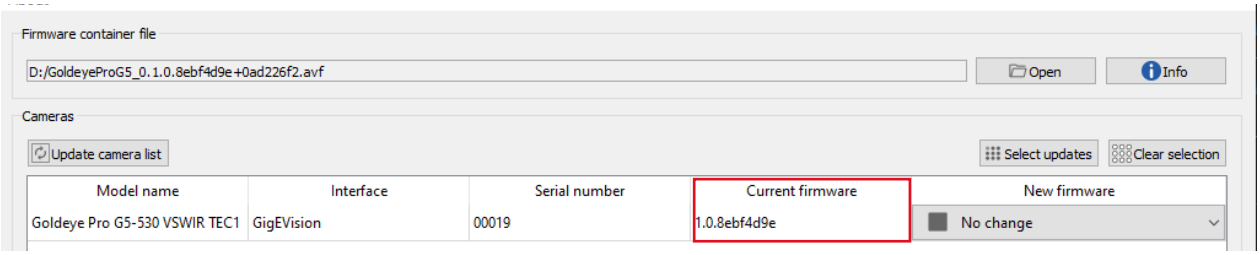


Figure 35: The updated firmware version is displayed

Error handling

If the device does not appear in the viewer app's camera list after the update:

1. Wait at least 10 minutes after the last noticeable progress in the **Vimba X Firmware Updater**.
   The LEDs toggle between **red**, **green**, and **yellow** while the camera verifies the uploaded firmware and writes it into the non-volatile memory. As long as the LEDs toggle, the camera is busy and **must not be power cycled**.
2. If this state lasts much longer than 10 minutes, the update might have failed.
3. Power cycle the device.
4. Wait at least 10 minutes again and update the camera list.
5. If the camera is listed, check if the correct firmware version is active. If the firmware version is not as expected, repeat the firmware update.

Should the firmware update not succeed, please contact Allied Vision Support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

Performance and troubleshooting

This chapter includes:

Tips and tricks to connect 5GBASE-T

Goldeye Pro G5 cameras require different hardware and settings than 1000BASE-T cameras like Goldeye G. This section is going to help you setting up applications more easily.

Dropped frames

The data rates output by current Goldeye Pro G5 cameras may create very high load on your system. Make sure that you are using the latest firmware, drivers, and software for optimum performance and reliability.

Troubleshooting

This section is covering most common issues to enable proper camera operation. Should you need more help, see Troubleshooting common issues on page 136.

Hardware selection

The selection of hardware components is a key factor to minimize the risk of dropped frames. This can be achieved by, for example, the recommended NICs to reduce the workload for the CPU or by real-time operating systems.

All components must support the link speed required to transfer and process the data output by the camera. Otherwise, the link speed of the camera must be configured accordingly. If a segment of the path through the network is under heavy load, a QoS (quality of service) can be used to ensure the needed throughput.

Recommended products

Recommendations for products are based on tests and positive experience. We plan to extend these recommendations in future.

CPU hardware

The number of CPU cores is important. Depending on the application, at least 4 physical CPU cores (8 Hyper-Threading cores) are required to limit the risk of dropped frames. Reserve roughly one CPU core to process the network packets delivered by one camera at 5 GBit/s.

NIC hardware

We recommended using NICs that support Jumbo Frames with a size of 16,000 bytes, with one NIC per camera.

Recommended NICs

From our first experience, NICs with **Aquantia 10GBASE-T** or **5GBASE-T** chips work well. We recommend using:

- QNAP QXG-5G1T-111C (1-port, no PoE)
- QNAP QXG-5G2T-111C (2-port, no PoE).

Power injectors

Especially when using midspan power sourcing equipment (PoE injectors), make sure that it is at least IEEE 802.3af (class 0) compliant and is explicitly specified to support a link speed of 5GBASE-T or better.

SFP+ adapters

Inexpensive RJ45 / xBASE-T SFP+ modules can be used to integrate cameras in fast (Q)SFP+ or (Q)SFP28 equipment. Please check that SFP+ modules support 5GBASE-T.

Note that Ethernet Flow Control and Jumbo Packet support may be restricted. Throughput and reliability tests with the actual network equipment are highly recommended.

NIC firmware and drivers

Consider updating the firmware of the NIC, if available. Use newest drivers available.

For QNAP QXG-5G1T-111C and QNAP QXG-5G2T-111C, driver version 2.1.21.0 or newer should be used.

Operation system settings

Settings under Linux

Be aware of automated network configuration tools. If configured incorrectly, these tools can periodically remove the network settings and try to find a connection to the Internet. Use a static configuration and deactivate these tools to avoid issues.

Settings under Windows

- Disable any power-management that might impact the performance, especially on NICs, PCIe or the CPU.
  - Activate **Ultimate Performance** for power plan.
  - Disable sleep modes that turn off the screen.
- Avoid unnecessary CPU and network load, also on different network adapters where no camera is connected.
- Disable antivirus software if possible.
- Avoid system events causing lost packets, such as by plugging in USB devices.

Vimba X TL settings

Configuring the transport layer settings in **Vimba X**, can help to reduce dropped frames significantly. Look out for GenICam feature names starting with **GVSP**. Because every system is specific, individual experiments must be done.

This is an overview of GigE TL streaming features.

Transport layer feature descriptions

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

GVSPDriverSelector

`GVSPDriverSelector` controls which software component is used to handle the streaming.

- **Windows**: Either the stream engine of the transport layer or the filter driver is used to receive and process the GVSP packets.
- **Linux**: Only the transport layer can be used.
- **Values**:
  - *`Socket`*: Use of the transport layers stream engine
  - *`Filter`*: Use of the filter drivers stream engine

Figure 36 gives an overview of the different stream handling methods.

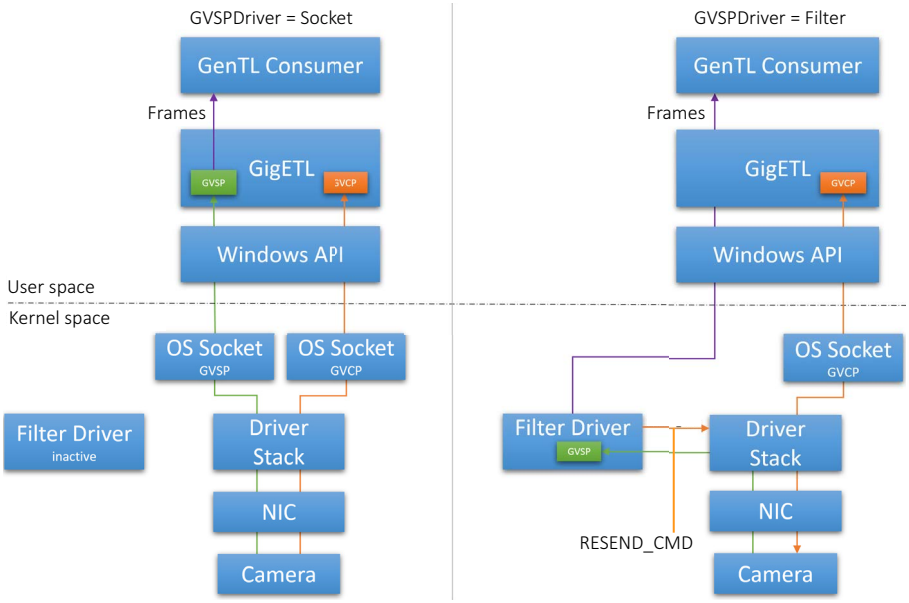


Figure 36: Stream handling with GVSPDriverSelector set to Socket or Filter

The filter driver minimizes the risk of lost frames substantially because it reduces the interactions between the user space and the kernel space, taking workload off the system:

When `GVSPDriver` is set to ***`Socket`***, GVSP packets are processed in the user space. The downside of this approach: For each packet, system calls from the user space are required to enable GVSP packets pass from the kernel space.

Switching and transferring data between the kernel space and the user space is a time consuming process. This limits the number of GVSP packets a system can handle per second. A 5GBASE-T link can easily exceed this limit.

When `GVSPDriver` is set to ***`Filter`***, the GVSP packets are processed by the filter driver that runs in the kernel space. This removes the linear dependency between system calls and GVSP packets. The filter driver copies the complete frame into the user space, coupling the number of system calls to the frame rate. Since the frame rate is substantially lower then the packet rate, the system has more resources left to handle the GVSP packets.

We recommend using the filter driver instead of the socket driver to increase performance and reliability.

If you cannot use the filter driver, you can reduce the number of GVSP packets per second. Increasing `GVSPPacketSize` is the only option to achieve this without reducing the performance of the camera.

GVSPPacketSize

`GVSPPacketSize` configures the total size of a GVSP packet, including the IP-, UDP- and GVSP headers.

The performance of the stream processing is largely determined by the number of received packets. Figure 37 shows how `GVSPPacketSize` affects the CPU load during streaming at different packet sizes for the socket driver and the filter driver.

The diagram shows the total CPU load over all cores; on single cores, the difference between socket and driver is much larger. Values on your system may vary from values measured on our test system, but the relation is the same.

The packet size is inversely proportional to the number of packets per second. Figure 37 shows that increasing the packet size reduces the number of packets, minimizing the risk of lost frames.

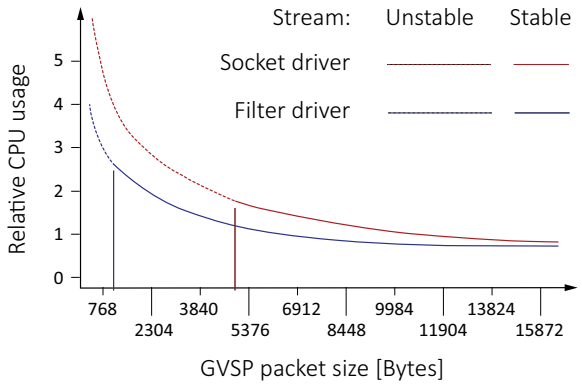


Figure 37: GVSPPacketSize versus CPU usage while the camera is streaming

Notes
We recommend allowing the maximum packet size possible. To determine the maximum packet size supported by your system, the **Vimba X** APIs include an automatic detection: Executing the `GVSPAdjustPacketSize` command first negotiates with the camera for the best possible packet size, then automatically sets `GVSPPacketSize`.

In addition, **Vimba X Viewer** automatically adjusts the packet size by default.

If the detected size is 1500 Bytes or less, ensure that Jumbo Frames are enabled on the host. Jumbo Frames must be enabled on all active Ethernet components on the path between camera and host.

GVSPBurstSize

`GVSPBurstSize` configures the number of GVSP packets that are processed at once before further checks, like missing packet detection, are executed.

Note: Currently the stream performance is not significantly affected. We recommend using the default value of ***1***.

GVSPHostReceiveBufferSize

`GVSPHostReceiveBufferSize` controls the socket buffer space used to receive GVSP packets. The operating system adjusts the socket buffer continuously. The value may be limited internally by the operating system. See the SO_RCVBUF documentation of the operating system.

Note: This feature cannot be used with the filter driver.

GVSPTimeout

`GVSPTimeout` is used to react on a possible streaming interruption. If no GVSP packet is received during the last `GVSPTimeout` milliseconds, the stream engine forces a resend of currently missing GVSP packets.

Dropped frames with certain ROIs

With certain ROIs, dropped frames may occur. This can mostly be avoided when `GVSPTimeout` is set to 1/frame rate.

GVSPTiltingSize

`GVSPTiltingSize` is used to cancel the reception of a single frame if a certain number of GVSP packets of the following frame has already been received.

The frame is marked as incomplete and returned to the GenTL consumer.

GVSPMaxRequests

`GVSPMaxRequests` is used to configure the maximum amount of RESEND_CMDs requested for a missing GVSP packet. Setting the feature to ***0*** disables the GigE Vision resend mechanism. The transport layer or filter driver does not request the re-transmission of any missing GVSP packet.

GVSPMissingSize

`GVSPMissingSize` is used to cancel the reception of a single frame if the resend limit ***`GVSPMaxRequests`*** is reached for too many packets. The frame is marked as incomplete and returned to the GenTL consumer.

Configuring the resend behavior

`GVSMaxLookBack` and `GVSPMaxWaitSize` can be used to configure the "timing" of *`RESEND_CMD`*s.

GVSPMaxLookBack

`GVSPMaxLookBack` can be used to delay the first ***`RESEND_CMD`*** for a missing GVSP packet by X packets.

GVSPMaxWaitSize

`GVSPMaxWaitSize` can be used to delay the *`RESEND_CMD`* for the same missing GVSP packet. The transport layer or the filter driver waits until `GVSPMaxWaitSize` of packets has been reached before requesting a resend for the same packet again.

Example:

Figure 38: Controlling the resend of packets

Sharing network bandwidth

We recommend using point-to-point links for best performance. If you must aggregate several cameras over a common link, add an offset to the calculated throughput. In fact, a shared 10G link can limit the performance of two Goldeye Pro G5 cameras connected.

Dark current compensation for IMX sensors

All sensors accumulate dark current in the pixels. Dark current increases the signal level and black level. Sony IMX99x sensors in Goldeye Pro G5 cameras compensate for this.

If cameras are operated at high temperatures or long exposure times, compensation reaches its limits. The typical compensation mechanism uses a **margin** to compensate for dark current. This works only until dark current reaches the size of the margin. The following table shows the relation of the margin and accumulated dark current for a pixel in 8-bit mode with a maximum value of 255.

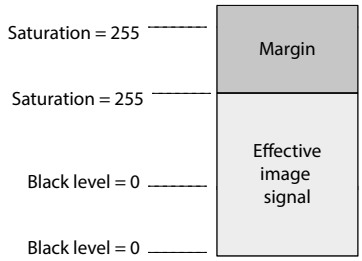
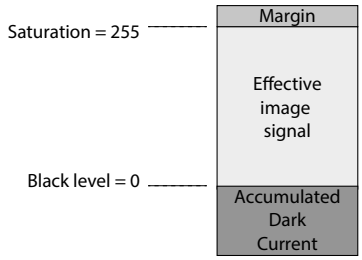
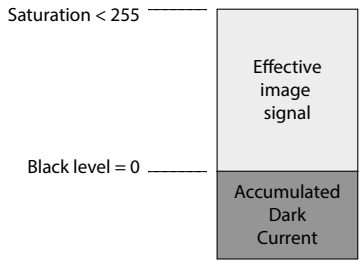
Effective signal versus noise	Description
	The pixel has accumulated no dark current, the margin has maximum size.
	The pixel has accumulated some dark current, reducing the size of the margin.
The following images show a pixel that has accumulated a higher dark current than the margin.	
	The pixel has accumulated dark current, the margin reduces to 0. • Dark current compensation stays active. • Maximum saturation signal decreases. • Fixed pattern noise increases. This sensor-internal compensation is typically used in the analog domain.

Table 66: Accumulated dark current affecting the effective image signal

Additional compensation

If compensation limits are reached and you cannot decrease operating temperature or exposure time, what can you do to keep signal quality high?

You can increase the margin size by using gain, with the following side effects:

- To give space to a larger margin, the effective pixel capacity decreases.
- White and light gray values are shifted down to gray.

Operating systems and bandwidth

If the camera data output exceeds the bandwidth supported by the host computer, images may be corrupted. This section gives some background information to enable proper image transfer.

DeviceLinkThroughputLimit

`DeviceLinkThroughputLimit` controls the maximum bandwidth of the data streamed out by the camera. Consider that applications, such as **Vimba X Viewer** are not aware if the configured value exceeds the bandwidth supported by the host computer.

Feature description for DeviceLinkThroughputLimit

See the Goldeye Pro Features Reference at www.alliedvision.com/en/support/technical-documentation/goldeye-pro-g5-documentation.

Hardware and bandwidth

For a smooth data transfer of Goldeye Pro G5 cameras, the host computer must be equipped with a high-bandwidth 5GBASE-T compliant NIC. We recommend using direct point-to-point links from camera to NIC for best performance. See Recommended NICs on page 128.

Vimba X settings

During freerun, Goldeye Pro G5 cameras do not automatically adapt the frame rate to the limits of your system, including the NIC. If the data rate is too high, it receives corrupted frames. The image transfer status in **Vimba X Viewer** is signaled as **Running**. However, the corrupted frames are not displayed. For a solution, see Camera cannot acquire images on page 137.

Troubleshooting common issues

Camera is not powered

Camera or system issue?

If a camera cannot be operated, check if this is possible with a known working camera.

Power supply

If using a custom power supply, ensure that

- The adapter and wire gauge are rated 2 A at 12 VDC (lower current for higher voltages).
- The 12-pin Hirose connector is supplied with minimum 10.8 VDC despite voltage drop across the cabling.

Camera is not detected in the viewer

The camera is powered correctly, but it is not detected in the viewer.

Ethernet cabling

Damaged or poor quality Ethernet cabling can result in no cameras found, dropped packets, decreased bandwidth, and other problems. Use Category 6 or higher rated Ethernet cabling.

NICs and NIC ports

NICs or Ethernet adapters using Intel I219-LM chipset may not activate the link when an Goldeye Pro G5 camera is connected directly. As a workaround, connect the camera to a different network adapter.

Ethernet adapter settings

Return to Setting IP addresses on page 90, which describes how to adjust the IP address of the host adapter. Do not use gateways on your NIC. Connect a single camera directly to your NIC.

Ensure that the adapter's and the camera's IP addresses use the same subnet. If not, return the adapter address to the Auto IP configuration. A sample IP configuration for the camera and adapter is shown below.

Item	Adapter	Camera
IP address	169.254.23.2	169.254.43.3
Subnet mask	255.255.0.0	255.255.0.0

Table 67: Sample IP configuration

Camera cannot acquire images

The camera is detected in the viewer but does not acquire images.

Revert the camera settings to factory default: In the controller window of **Vimba X Viewer**, under `SavedUserSets`, set `UserSetDefaultSelector` = *`Default`*, click `UserSetLoad`, and click the `Execute` button.

If StatFramesDelivered or StatPacketsReceived = 0

- Click on `Stream` > *`Statistics`* to view camera freerun statistics.
- Disable your firewall on Ethernet adapter connected to camera to avoid blocking incoming traffic.
- Ensure that in **Vimba X Viewer**:
  `AcquisitionFrameRateEnable` = *`True`*
  `TriggerSelector` = *`FrameStart`*
  `TriggerSource` = *`Software`* or *`LineX`*
- Consider that some trigger modes require a trigger event to capture frames.

If StatFramesDropped ≠ 0

Packets are incoming, but all dropping.

Enable Jumbo Frames on your adapter and check other settings, see Connecting to the host computer on page 89.

If StatFramesDelivered value increases, but images are black

- Ensure your scene is sufficiently lit.
- Increase the exposure time value, using `ExposureTimeAbs`.
- Ensure the lens is properly installed and the lens cap has been removed.

Application support

If you are still having problems, please contact support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

Avoiding dropped packets

- Check the Ethernet cable. A damaged cable often causes the link to negotiate a lower speed as fallback.

- **Windows**: Disable auto updates and telemetry (additional note for **Linux**, see below).
- Use the recommended NICs, see Recommended NICs on page 128.
- Use the latest NIC driver from the NIC manufacturer.
- Enable Jumbo Frames/Packets on the NIC. Larger packets result in less overhead on the host CPU. See Enabling Jumbo Packets on page 87.

Available packet size

Be aware that the effective maximum packet size is limited to the biggest common size supported by all network devices on the path.

- Enable Ethernet Flow Control on NICs and switches, see Advanced NIC driver settings on page 87.
- Disable the firewall if no filter driver is used.
- If possible, use a dedicated network infrastructure:
  - Ideally, each camera has a point-to-point connection to a dedicated network adapter in the host.
  - Separate camera networks from other networks.
  - Avoid aggregating multiple cameras over a single network link if possible. The more cameras use a common link, the lower becomes the usable total system throughput, caused by packet losses or less effective processing on the host side.

- **Linux only**: Run as root, allowing the OS to boost the priority of the Allied Vision driver thread, and the driver to bind directly to the NIC adapter. Users who feel running as root compromises their system security may find the following implementation satisfactory:
  - Set the executable owner as root.
  - Set the "`setuid`" permission bit on the executable.
  - In code, when application starts use capset() to release all but these privileges: CAP_SYS_NICE, CAP_NET_ADMIN, CAP_NET_BROADCAST, CAP_NET_RAW. The application will start with all root privileges, but it will drop them immediately after startup.

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