Allied Vision

USB3 VISION CAMERAS

# Alvium USB Cameras

# User Guide

See Model IDs covered by this user guide on page 59 for
the hardware versions of Alvium USB cameras that are used in DoC (EU declaration of conformity) documents.

V5.2.0

**Latest FW: V00.14.03.4646d35d**

Note: Lenses are not part of this product.

**Quick links**

- Alvium USB cameras at a glance on page 15
- Contact us on page 21
- Contents on page 22

# 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 62.

**WARNING**

This product can expose you to chemicals including Lead and Lead Compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. 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**

The product 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.

## Cameras without closed housings

Cameras without housing or with incomplete housing must be shielded against EMC emission by professionals according to local EMC provisions.

# DA - Dansk

## Sikkerhed

Læs sikkerhedsanvisningerne, før kameraet bruges. Overhold alle advarsler. Brug kun kameraet som anført i Intended use på side 62.

**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 skarpe kanter**

Produktet 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.

## Kameraer uden lukket hus

Kameraer uden hus eller uden komplet hus skal beskyttes mod EMC emissioner iht. lokale EMC bestemmelser.

# 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 62.

**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 scharfe Kanten**

Das Produkt kann 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.

## Kameras ohne geschlossenes Gehäuse

Für Kameras ohne Gehäuse oder mit unvollständigem Gehäuse muss die Abschirmung gegen EMV-Emissionen gemäß den örtlichen EMV-Bestimmungen durchgeführt werden.

# 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 62.

**ADVERTENCIA**

Este producto puede exponerle a químicos incluyendo plomo y compuestos de plomo, que son conocidos por el Estado de California como causantes de cáncer y defectos de nacimiento u otros daños reproductivos.
Para mayor información, visite 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 por bordes afilados**

El producto puede 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.

## Cámaras sin carcasa cerrada

Las cámaras sin carcasa o con una carcasa incompleta deben protegerse contra las emisiones CEM por parte de profesionales de acuerdo con las disposiciones locales sobre la CEM.

# FI - Suomi

## Turvallisuus

Lue nämä turvallisuusohjeet ennen kameran käyttöä. Noudata varoituksia joka hetki. Käytä kameraa ainoastaan kohdassa Intended use sivulla 62 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**

**Terävien reunojen aiheuttama viiltovaara**

Tuotteessa voi olla teräviä reunoja.

## Käyttötarkoitus

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

## Kamerat, joissa ei ole suljettuja koteloita

Ammattilaisten on suojattava kamerat, joissa ei ole koteloa tai joiden kotelo on epätäydellinen, EMC-päästöiltä paikallisten EMC-määräysten mukaisesti.

# 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 62.

**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 des bords tranchants**

Le produit peut 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.

## Caméras sans boîtier fermé

Les caméras sans boîtier fermé ou à boîtier incomplet doivent être blindées contre les émissions CEM par le soin de professionnels conformément aux dispositions CEM locales.

# 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 62.

**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.

## מצלמות ללא מארז סגור

מצלמות ללא מארז, או עם מארז חלקי בלבד, חייבות להיות מוגנות בפני קרינה אלקטרומגנטית (EMC) על ידי אנשי מקצוע בהתאם לתקנים המקומיים (EMC).

# 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 62.

**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**

I bordi del prodotto 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.

## Telecamere senza custodia chiusa

Le telecamere senza custodia o con una custodia incompleta devono essere protette dalle emissioni elettromagnetiche in ambienti professionali in conformità con le norme CEM nazionali.

# 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 62 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**

**な端部で切り傷の危険性**

本製品には鋭利な部分がある場合があります。

## 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。

## ハウジングで閉じられていないカメラ

ハウジングのないカメラまたはハウジングが不完全なカメラは、現地の電磁両立性（EMC）規定に従い、専門家によって、EMCエミッションから保護される必要があります。

# 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 62.

**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**

Het product 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.

## Camera's zonder gesloten behuizing

Camera's zonder behuizing of met een onvolledige behuizing moeten door professionals worden beschermd tegen EMC-straling door EMC-beschermingen ter plaatse.

# 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 62.

**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**

Produktet 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.

## Kameraer uten lukkede kamerahus

Kameraer uten kamerahus eller med ufullstendige kamerahus må beskyttes mot EMC-utslipp av fagfolk i henhold til lokale EMC-bestemmelser.

# 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 62.

**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**

Produkten 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.

## Kameror utan slutna kamerahus

Kameror utan eller med ofullständiga kamerahus måste skyddas mot elektromagnetiska emissioner av fackmän enligt lokala bestämmelser för elektromagnetiska emissioner.

# 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 62 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**

**锋利边缘割伤的风险**

产品可能有锋利的边缘。

## 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。

## 无封闭式外壳相机

使用不带外壳或外壳不完整的相机时，必须由专业人员根据当地的 EMC 规定，对其进行 EMC 屏蔽。

# Alvium USB cameras at a glance

Get an overview of Alvium USB camera documentation:

# Consider for Alvium USB cameras

Please read the following to better understand your Alvium USB camera and to setup your application smoothly:

- Exposure time and frame rates on page 77
- Alvium USB properties: Performance and troubleshooting on page 313
- User sets on page 248, including supported features and trigger features
- Reducing the power consumption: DevicePowerSavingMode on page 323
- Bare board cameras on page 270

# Shipping contents

- Alvium USB camera
- Download Instructions for First Camera Operation document

# What else do you need?

This is a selection of helpful downloads:

| Download | Link |
|---|---|
| Alvium Cameras Features Reference | www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation |
| Application notes | |
| **Alvium Modular Concept** for extended hardware options, such as Alvium Frame or Flex. | |
| **Vimba X SDK** for Windows, Linux, Linux/ARM, and macOS, 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 |
| **STEP files** | Downloads for standard Alvium USB models: www.alliedvision.com/en/camera-selector<br>Downloads for Alvium Flex or Frame: www.alliedvision.com/en/support/alvium-step-file-downloads |
| Assembling Alvium Cameras from CAD Components (application note) | www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation |
| **Accessories**, such as interface cables and cards, power and I/O cables, power supplies, lenses, and tripod adapters | www.alliedvision.com/en/products/accessories |

*Table 1: Downloads for Alvium USB cameras*

# Alvium Flex - more flexibility

Hardware options for standard Alvium cameras support various digital interfaces, housings, and lens mounts to enable a wide range of applications.

You have found that Alvium USB cameras with USB 3.0 Micro-B connector do not offer enough flexibility for your application? You want to use your own cables and connectors?

Alvium Flex cameras with Hirose DF40C-50DP-0.4V board-to board connector enable individual connections. Alvium Flex accessories can be used for developing and first testing. Figure 1 shows how Add-on Boards connect to Alvium Flex cameras.

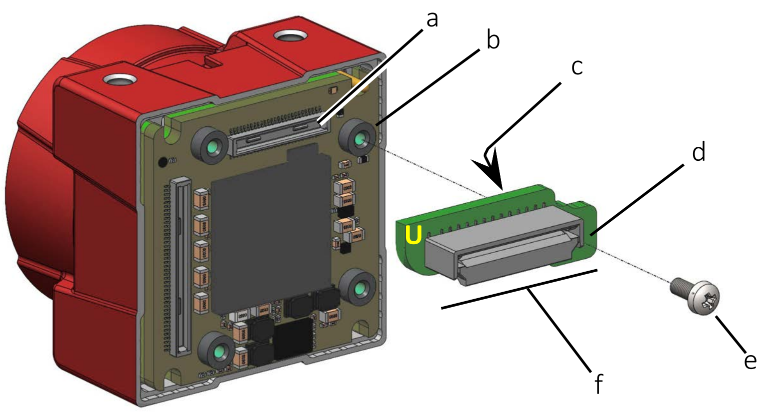


*Figure 1: Alvium USB Flex camera, Interface Board, and screw*

a: Hirose DF40C-50DP-0.4V camera connector
b: Mounting thread
c: Hirose DF40C-50DS-0.4V board connector
d: Mounting hole
e: Fastening screw
f: Add-on Board

## Alvium USB Flex

The following options are offered for **Alvium USB Flex** cameras. Above developing and testing, Alvium Flex can solve typical issues with **standard Alvium USB** cameras.

### Individual solutions

Hirose DF40 board-to-board connector enables individual connections to your own boards and cables.

## Off-the-shelf solutions

You are about to build an Alvium USB camera into your machine, but you want to separate the connectors for USB and I/Os from the camera back panel? Or you prefer to connect your Alvium USB camera to your own board without using clumsy USB cables? **Alvium USB Flex Interface Board Screw-on** enables moving the standard back panel to a new position, and it supports individual solutions.

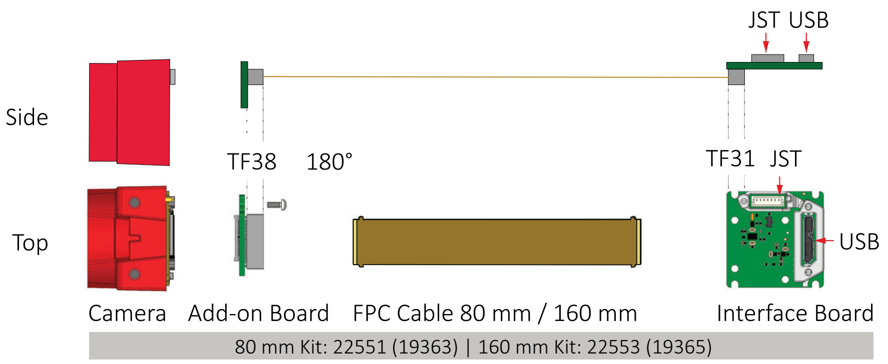


*Figure 2: **Alvium USB Flex** camera connections with Interface Board Screw-on*

**Alvium USB Flex Interface Board Compact** supports solutions for minimum space.

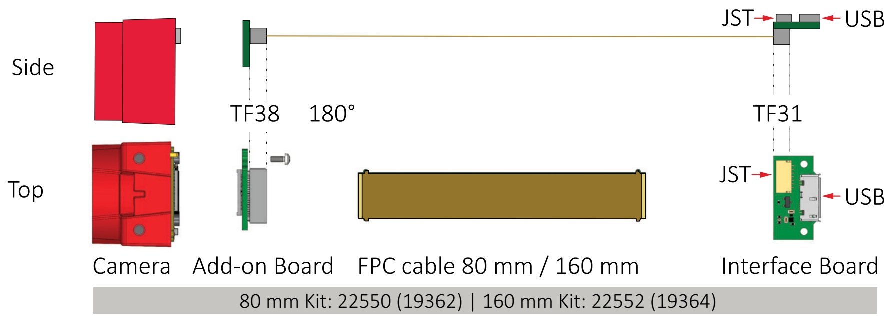


*Figure 3: **Alvium USB Flex** camera connections with Interface Board Compact*

**Alvium USB Flex accessory kits without interface boards**

USB Add-on Board + FPC Cable 80 mm: 19367

USB Add-on Board + FPC Cable 160 mm: 19368

**Alvium Flex cameras**

See contents in Specifications on page 72 and in Camera interfaces on page 289.

**Alvium Flex accessories and instructions**

See the Alvium Flex Design and Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

# Alvium Frame - use your own optical mount

You want to design your own lens mount for Alvium USB cameras or your application does not need a lens mount? In this case, Alvium Frame adds more flexibility. The square front flange with only 10 mm depth aligns to your individual housing with an extremely high accuracy.

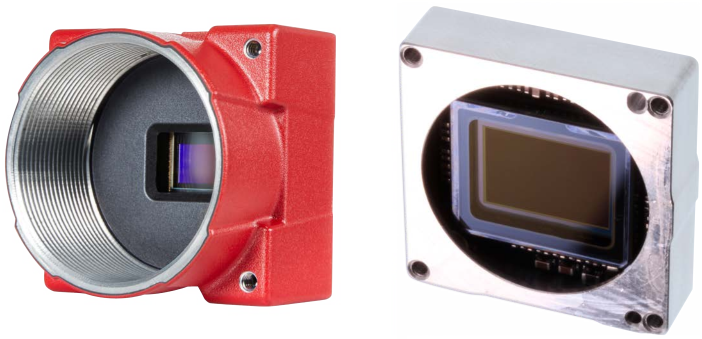

*Figure 4: Standard Alvium USB open housing (left) vs. Alvium USB Frame (right)*

## Specifications


- Alvium Frame: Dimensions and mass on page 240
- Alvium Frame: Technical drawings on page 240
- Sensor position accuracy on page 245


## Instructions


Installing Alvium Frame cameras on page 276:

- Aligning the sensor with your optical system on page 276
- Mounting Alvium Frame on page 278


**Ordering Alvium Frame cameras**

See the Alvium Modular Concept at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

**Alvium Frame Flex**

You can combine hardware options for Alvium USB Frame Flex cameras.

# Alvium Pol - using polarization

Alvium polarizer cameras are equipped with Sony IMX Polarsens sensors that support four-directional polarization using filters directly in front of the sensor. With these cameras, you can replace additional polarizer filters on the lens used in typical applications. In many cases, polarizer sensors can adapt easily to setups with varying polarization angles; there is no need to change or rotate optical polarization filters anymore.
You can use polarized light imaging, for example, to reduce reflections or for surface analysis regarding stress and defects. Figure 5 shows how the orientation of the polarization filters affects brightness values for the sub-images:


*Figure 5: Polarization angle versus image brightness in sub-images*

Current models:

- Alvium 1800 U-507m/c Pol on page 157
- Alvium 1800 U-508m/c Pol on page 164

**Please observe**

For first series models, pixel processing has not been adjusted to enable the complete functionality available with non-polarizer models:

- Only raw pixel formats are supported, but no formats for polarizer sensors.
- Features based on pixel processing are available but cannot be used to generate a proper output. For example, color processing, binning, convolution filter, DPC, or FPNC are not supported.

**More information**

See the Pixel based polarizer application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

# Contact us

## Website, email

**General**
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# Contents

# Document history and conventions

This chapter includes:

# Document history

| Version | Date | Remarks |
|---|---|---|
| V5.2.0 | 2025-Dec-09 | **Firmware version**<br>• Alvium 1800 U main firmware: 00.14.03.4646d35d<br>• Alvium 1800 U-131, 1800 U-192: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated the reference firmware version: Some bugs were fixed, but no features or specifications were changed.<br>• Added contents for easier access to Model IDs used for the DoC (Document of Conformity):<br>- Added a note on the title page.<br>- Added the headline Model IDs covered by this user guide on page 59 to the existing table. |
| V5.1.0 | 2025-Nov-17 | **Firmware version**<br>• Alvium 1800 U main firmware: 00.14.01.d83c7207<br>• Alvium 1800 U-131, 1800 U-192: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Corrected swapped H and V values for multiple ROI in the tables with Alvium 1800 U model specifications on page 86.<br>• For improved housings, updated data:<br>- Replaced technical drawings in Standard Alvium: Technical drawings on page 220 and in Alvium Flex: Technical drawings on page 236.<br>- Updated maximum lengths for screws and maximum torque values in Mounting the camera on page 273.<br>• Added a note for Alvium Flex and Frame cameras in Shock and vibration on page 74.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 1 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V5.0.1 | 2025-Jul-14 | **Firmware version**<br>• Alvium 1800 U main firmware: 00.14.01.d83c7207<br>• Alvium 1800 U-131, 1800 U-192: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Removed UKCA logo from Compliance notifications on page 59.<br>• Removed contents for ISO 13485 and updated definitions for Intended use on page 62.<br>• Updated Handling hot cameras on page 63.<br>• Added a note for optical cleaning in Sensor cleanliness on page 69.<br>• In Specifications on page 72, updated information for frame rates when color models of Alvium 1800 U-1240 and 1800 U-2050 are operated in triggered mode. (Preliminary changes were already added with V5.0.0 of this document.)<br>• Changed supported sensor binning mode to 2 × 2 (`Sum`) for 1800 U-500 and 1800 U-501 NIR in Specifications on page 72.<br>• Updated I/O descriptions in Table 143: Pin assignment of the JST BM07B-SRSS-TBT type I/O connector on page 292 and in Table 144: Hirose DF40C-50DP-0.4V connector pin assignment on page 295.<br>• Updated graphics for DF40C-50DP-0.4V connector in Back panel on page 293.<br>• For selected camera models, added support to monitor the sensor temperature in Camera feature availability on page 249.<br>• Renamed Type IRC Hoya C-5000 filter to Type IRC 625 colored glass filter in IR cut filter on page 244.<br>Applied editorial changes. |

*Table 2: Document history (sheet 2 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V5.0.0 | 2025-Feb-13 | **Firmware version**<br>• **Release**: Alvium 1800 U main firmware: 00.14.01.d83c7207<br>• Alvium 1800 U-131, 1800 U-192: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated the reference firmware version: Several bugs were fixed, but no features or specifications were changed.<br>• Updated contents for Sensor cleanliness on page 69.<br>• Updated graphic elements in Image data flow diagram on page 306.<br>• Applied editorial changes. |
| V4.9.0 | 2024-Nov-07 | **Firmware version**<br>• **Release**: Alvium 1800 U main firmware: 00.14.00.baba1e3c<br>• Alvium 1800 U-131, 1800 U-192: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated the related firmware versions.<br>• Updated contents on KC for simplicity in Compliance notifications on page 59.<br>• Updated values for maximum power consumption in DevicePowerSavingMode on page 323. |

*Table 2: Document history (sheet 3 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.8.0 | 2024-Oct-01 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-320 VSWIR, -530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updates to Read before use on page 2:<br>  - Updated Hebrew safety notes.<br>  - Added safety notes for Proposition 65 by the State of California.<br>• Added macOS support for Vimba X.<br>• Updated contents in Providing optimum heat dissipation on page 63 for Alvium VSWIR models.<br>• Updated descriptions on bandwidth in Operation for maximum frame rates on page 79.<br>• Added contents for ***Region0*** in Multiple regions on page 82.<br><br>Continued on the next page. |

*Table 2: Document history (sheet 4 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.8.0 | 2024-Oct-01 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-320 VSWIR, -530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>Continued from previous page.<br>• Updates in Alvium 1800 U model specifications on page 86:<br>  - Removed "Coming soon" status for 1800 U-320 VSWIR, -507 Pol, -508 Pol.<br>  - Replaced calculated values for ROI fps by measured values for 1800 U-320 VSWIR.<br>  - Added power consumption for 1800 U-320 VSWIR.<br>  - Added notes for heat dissipation with VSWIR models.<br>• Removed contents for Alvium 1800 U-831 and 1800 U-832 from this document.<br>• In Image data flow on page 305, added a link to Value changes by feature interdependencies on page 315 for the order of flipping and ROI.<br>• Applied editorial changes. |
| V4.7.4 | 2024-Jul-23 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>Replaced calculated values for ROI frames by measured values for Alvium 1800 U-131 and -192 in Alvium 1800 U model specifications on page 86. |

*Table 2: Document history (sheet 5 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.7.3 | 2024-Jun-25 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Completed firmware versions in this table for log entries down to V4.0.0.<br>• Updated the addresses of Sales offices in Contact us on page 21.<br>• Updates in Alvium 1800 U model specifications on page 86:<br>  - Removed "Coming soon" status for 1800 U-131 and -192 models.<br>  - Added curves for QE and partly for relative response for Alvium 1800 U-052, -203, -291, -320 VSWIR, -530 VSWIR, and -895 models.<br>  - Updated curves for QE and relative response for Alvium 1800 U-510, -511, -811, and -1242 models. |
| V4.7.2 | 2024-Jun-12 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated data for 1800 U-131 and 1800 U-192 models in Alvium 1800 U model specifications on page 86:<br>  - Corrected exposure time values.<br>  - Changed maximum gain to 12.5 dB.<br>• Updated minimum exposure time values for 1800 U-320 VSWIR and -530 VSWIR models in Alvium 1800 U model specifications on page 86.<br>• Fixed issues in Camera feature availability on page 249. |

*Table 2: Document history (sheet 6 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.7.1 | 2024-Jun-06 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-530 VSWIR: 00.13.02.46198eb2 Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added notes for white balance with 1800 U-131 and 1800 U-192 models in Specifications on page 72.<br>• Added notes for Alvium 1800 U-831 and -832 that ROI frame rates have been calculated in Alvium 1800 U model specifications on page 86.<br>• Corrected typos.<br>• Applied editorial changes. |
| V4.7.0 | 2024-Jun-04 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• **Release**: Alvium 1800 U-530 VSWIR: 00.13.02.46198eb2<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated the address of the Shanghai office in Contact us on page 21.<br>• Removed "Coming soon" status for Alvium 1800 U -530 VSWIR. (Alvium 1800 U-320 VSWIR will be coming soon.)<br>• Changes to Specifications on page 72, Focal length vs. field of view on page 254, and in FPNC support on page 307: Added 1800 U-831 and -832 models that will be coming soon.<br>• Reduced maximum exposure time for Alvium 1800 U-500 and -501 NIR to 0.48 s in Specifications on page 72.<br>• Added QE curves for models coming soon: 1800 U-320 VSWIR and -530 VSWIR in Specifications on page 72.<br>• Added a note about Measurements for QE and spectral response on page 76.<br>• Added a note in Values in Bare Board drawings on page 221 for calculating Mechanical length to design your own S-Mount models.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 7 of 23)*

| Version | Date | Remarks |
| --- | --- | --- |
| V4.6.2 | 2024-May-07 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added model list for KC compliance in Camera identification on page 59.<br>• Removed "Coming soon" status for Alvium 1800 U-507 Pol and-508 Pol.<br>• Extended contents for ***StandbyMode*** in DevicePowerSavingMode on page 323.<br>• Applied editorial changes. |
| V4.6.1 | 2024-Mar-27 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Reworded Cable connections on page 65 and added contents for using screw-lock USB cables.<br>• Added Connecting USB cables on page 284. |
| V4.6.0 | 2024-Mar-22 | **Firmware versions**<br>• **Release**: Alvium 1800 U main firmware: 00.13.01.794391f9<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added Available subregion resolutions on page 83.<br>• Added QE curve for Alvium 1800 U-812 UV on page 182.<br>• Added ***StandbyMode*** to DevicePowerSavingMode on page 323 and updated descriptions.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 8 of 23)*

<table>
<tr><th>Version</th><th>Date</th><th>Remarks</th></tr>
<tr><td>V4.5.0</td><td>2024-Mar-05</td><td>Firmware versions<br>• Alvium 1800 U main firmware: 00.13.00.71d891fe<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>Applied changes<br>• Updated title image.<br>• Added introduction for Alvium Pol- using polarization on page 20.<br>• Added contents for manufacturing conditions regarding Sensor cleanliness on page 69.<br>• Added a note that the output bit depth affects the minimum available exposure times in Sensor ADC readout modes for maximum frame rates on page 77.<br>• Added contents for Brightness with 1800 U-812 UV cameras on page 81.<br>• Added power consumption for 1800 U-131 and -192 models in Alvium 1800 U model specifications on page 86.<br>• Updated contents in Specifications on page 72 and in Lenses: Focal length vs. field of view on page 252:<br>- Added models coming soon:<br>1800 U-320 VSWIR, -507 Pol, -508 Pol, and -530 VSWIR.<br>• Aligned sensor size values to 1 decimal place.<br>• Updated exposure time ranges in Alvium 1800 U model specifications on page 86.<br>• Added notes that bare board cameras must be aligned by the user in Specifications on page 72 and in Installing the camera on page 269.<br>• Reduced options for Temperature monitoring to “mainboard” only in Camera feature availability on page 249.<br>• Added information on FPNC support on page 307 and updated corresponding data in Camera feature availability on page 249.<br>• Renamed chapter Frame rate jitter to Parameter changes on page 314 and added contents for stopped streaming.<br>• Applied editorial changes.</td></tr>
</table>

*Table 2: Document history (sheet 9 of 23)*

| Version | Date | Remarks |
| --- | --- | --- |
| V4.4.1 | 2024-Jan-02 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.13.00.71d891fe<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>Fixed broken weblinks. |
| V4.4.0 | 2023-Dec-04 | **Firmware versions**<br>• **Release**: Alvium 1800 U main firmware: 00.13.00.71d891fe<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Updated table for Frame rates with rolling shutter sensors on page 79.<br>• Extended information on Sensor binning on page 82.<br>• Changes to Alvium 1800 U model specifications on page 86:<br>- Updated frame rates.<br>- Changed width resolution for 1800 U-510 and -511 from 2472 to 2464 pixels. (The width resolution for these models is 2464 with all firmware versions. In earlier versions of this user guide, 2472 pixels were specified incorrectly.)<br>- Added support for sensor binning for 1800 U-158m, -203m, -240m, -291m, and -508m.<br>- Separated Raw color pixel formats from RGB color pixel formats.<br>- Removed Packed pixel formats (only supported by Alvium G1 and G5).<br>• Updated Camera feature availability on page 249.<br>• Edited contents to separate between Alvium USB cameras with USB connector orientations of 90° and 180° in Specifications on page 72. |

*Table 2: Document history (sheet 10 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.3.3 | 2023-Nov-01 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>Added contents to avoid permanent damage to the sensor by ESD:<br>• Extended the note for ESD on page 65.<br>• Added Possible damage to image sensors due to electrostatic discharge on page 69 in the product safety chapter.<br>• Added a warning in Sensor damage by ESD on page 270 in the installation chapter. |
| V4.3.2 | 2023-Oct-25 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Corrected mass values for closed housing 1800 U-203 models in Standard Alvium: Dimensions and mass on page 218. |
| V4.3.1 | 2023-Oct-05 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Adjusted frame rate values for Alvium 1800 U-131m/c on page 108.<br>• Corrected images in Standard Alvium: Technical drawings on page 220.<br>• Corrected data for 1800 U-131 and 1800 U-192 in Camera feature availability on page 249. |

*Table 2: Document history (sheet 11 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.3.0 | 2023-Sep-27 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added 1800 U-203 models in Specifications on page 72 and in Lenses: Focal length vs. field of view on page 252.<br>• Added 1800 U-131 and 1800 U-192 models (coming soon) in Specifications on page 72 and in Lenses: Focal length vs. field of view on page 252.<br>• Updated technical drawings for bare board and open housing cameras in Standard Alvium: Technical drawings on page 220.<br>• Updated Cooling area for Alvium USB bare board cameras on page 272.<br>• Updated Mounting area of Alvium USB bare board cameras connector side (left); sensor side (right) on page 274.<br>• Applied editorial changes. |
| V4.2.3 | 2023-Aug-08 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Removed "Coming soon" status for Alvium Flex and updated product codes for Alvium Flex accessories in Alvium Flex- more flexibility on page 17.<br>• Removed "Coming soon" status for Alvium Frame in Alvium Frame- use your own optical mount on page 19. |
| V4.2.2 | 2023-Aug-02 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>Corrected values for length and mass for Alvium Frame: Dimensions and mass on page 240 and Alvium Frame Flex: Dimensions and mass on page 241. |

*Table 2: Document history (sheet 12 of 23)*

| Version | Date | Remarks |
| --- | --- | --- |
| V4.2.1 | 2023-Jul-05 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added 12-bit pixel formats in Alvium 1800 U model specifications on page 86.<br>• Changed horizontal resolution for 1800 U-510 and 1800 U-511 in Alvium 1800 U model specifications on page 86. |
| V4.2.0 | 2023-Jun-14 | **Firmware versions**<br>• Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added 1800 U-895m/c models in Alvium 1800 U model specifications on page 86 and in Lenses: Focal length vs. field of view on page 252.<br>• Applied editorial changes. |
| V4.1.0 | 2023-Jun-06 | **Firmware versions**<br>• **Release**: Alvium 1800 U main firmware: 00.12.00.00611a22<br>• Alvium 1800 U-050: 00.11.00.9cf0c21e<br><br>**Applied changes**<br>• Added safety notes for handling sharp edges of Alvium Frame cameras in Read before use on page 2, Handling lens mounts and Alvium Frame on page 62, and Installing Alvium Frame cameras on page 276.<br>• Added data on multiple regions and sensor binning for selected models in Alvium 1800 U model specifications on page 86, in Camera feature availability on page 249, and in Image data flow on page 305.<br>• Updated maximum frame rates for Alvium 1800 U-1620m/c on page 201 for a resolution of 5328 (H) × 3040 (V).<br>• Updated Serial numbers of Alvium® chips and bare board cameras on page 271. |

*Table 2: Document history (sheet 13 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V4.0.0 | 2023-Mar-30 | **Firmware version**: 00.11.00.9cf0c21e<br>• Added contents for Alvium USB Frame in:<br>- Alvium USB cameras at a glance on page 15<br>- Specifications on page 72<br>- Installing Alvium Frame cameras on page 276.<br>• Updated contents for **Vimba X**.<br>• Updated QE curves for 1800 U-030 VSWIR and 1800 U-130 VSWIR in Alvium 1800 U model specifications on page 86.<br>• Reduced value for sensor shift with 1800 U-2050 models to 150 µm in Sensor position accuracy on page 245.<br>• Added instructions to Firmware update on page 308.<br>• Applied editorial changes. |
| V3.9.1 | 2023-Feb-24 | **Firmware version**: 00.11.00.9cf0c21e<br>Updated page breaks to improve readability. |
| V3.9.0 | 2023-Feb-21 | **Firmware version**: 00.11.00.9cf0c21e<br>• Updated Hebrew contents in Read before use on page 2.<br>• Added contents for Alvium Flex- more flexibility on page 17, in Specifications on page 72 and in Camera interfaces on page 289.<br>• Updated Table 100: Bare Board and Bare Board 90° (standard Alvium and Alvium Flex) model specific dimensions and nominal values on page 222.<br>• Removed `ImageChunkData` from Camera feature availability on page 249.<br>• Updated Cooling area for Alvium USB bare board cameras on page 272.<br>• Applied editorial changes. |
| V3.8.1 | 2022-Nov-14 | **Firmware version**: 00.11.00.9cf0c21e<br>• Added note that lenses are not part of the product.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 14 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.8.0 | 2022-Oct-27 | **Release: Firmware version**: 00.11.00.9cf0c21e<br>• Updated standard references in Applied standards on page 73.<br>• Replaced previous calculated values for ROI frame rates by measured values in Specifications on page 72.<br>• Added note on deviations from stated frame rates in Specified values on page 77.<br>• Added 1800 U-510m/c models in Alvium 1800 U model specifications on page 86 and in Lenses: Focal length vs. field of view on page 252.<br>• Applied editorial changes. |
| V3.7.5 | 2022-Oct-19 | **Firmware version**: 00.10.00.6c9062b1<br>Updated ROI frame rates for 1800 U-234 and 1800 U-235 in Alvium 1800 U model specifications on page 86. |
| V3.7.4 | 2022-Sep-22 | **Firmware version**: 00.10.00.6c9062b1<br>Corrected entries for JST I/O cables in Table 146 on page 298. |

*Table 2: Document history (sheet 15 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.7.3 | 2022-Sep-20 | **Firmware version**: 00.10.00.6c9062b1<br>• Added Hebrew contents to Read before use on page 2.<br>• Changed units KB to KByte and Mbps to MByte/s for clarity.<br>• Added number for the South Korean KC Safety Certification in Compliance notifications on page 59.<br>• Corrected data in Alvium 1800 U model specifications on page 86:<br>- Max. gain for Alvium 1800 U-030 VSWIR and 1800 U-130 VSWIR was changed to 42 dB.<br>- 12-bit pixel formats were added to Alvium 1800 U-234 and 1800 U-235 models.<br>- Updated exposure time vales in tables with ROI frame rates for Alvium 1800 U-812 UV.<br>- Corrected sensor bit depth values to 10-bit for ROI frame rates of 1800 U-1240.<br>- Removed FPNC availability for 1800 U-234 and 1800 U-235.<br>• Added a note in Image data flow on page 305 that 1800 U-234 and 1800 U-235 models currently do not support FPNC.<br>• Applied editorial changes. |
| V3.7.2 | 2022-Aug-05 | **Firmware version**: 00.10.00.6c9062b1<br>Removed “Coming soon” status for Alvium 1800 U-812 UV on page 182. |
| V3.7.1 | 2022-Jul-22 | **Firmware version**: 00.10.00.6c9062b1<br>• Added values for minimum and maximum exposure times in Alvium 1800 U model specifications on page 86.<br>• Corrected dimensions for screws from M2 to M1.6 in Mounting bare board cameras on page 273. |

*Table 2: Document history (sheet 16 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.7.0 | 2022-Jul-14 | **Release: Firmware version**: 00.10.00.6c9062b1<br>• Added Camera identification on page 59, including Model ID for DoC assignment.<br>• Added symbol for South Korean KC Safety Certification in Compliance notifications on page 59.<br>• Updated data in Specifications on page 72 for:<br>- ROI frame rates and exposure time ranges<br>- Maximum gain for Sony IMX global shutter cameras increased to 48 dB<br>- Exposure Mode of various models.<br>• Added 1800 U-234m/c, 1800 U-235m/c, and 1800 U-812 UV models in Alvium 1800 U model specifications on page 86 and in Lenses: Focal length vs. field of view on page 252.<br>• Added the information that Alvium 1800 U-511 is supplied on request only to Sensor position accuracy on page 245.<br>• Added new functionalities to Camera feature availability on page 249.<br>• Added warning against voltage levels of serial communication in I/O connector pin assignment on page 291.<br>• Added I/O use for UART on page 297.<br>• Removed FPNC support for VSWIR models and added DPC support for 1800 U-052 and 1800 U-291 in Image data flow on page 305.<br>• Removed the section “Feature value changes on a streaming camera” from Optimizing performance on page 314.<br>• Applied editorial changes. |
| V3.6.4 | 2022-Apr-12 | **Firmware version**: 00.08.00.6727174b<br>• Added notes that Alvium 1800 U-052 and 1800 U-291 currently do not support DPC and FPNC to Image data flow on page 305.<br>• Applied minor editorial changes. |
| V3.6.3 | 2022-Mar-29 | **Firmware version**: 00.08.00.6727174b<br>Re added values for Alvium 1800 U-319c in White balance default on page 217. |

*Table 2: Document history (sheet 17 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.6.2 | 2022-Mar-25 | **Firmware version**: 00.08.00.6727174b<br>Updated mass values for closed housing Alvium 1800 U-158m/c at Standard Alvium: Dimensions and mass on page 218. |
| V3.6.1 | 2022-Mar-17 | **Firmware version**: 00.08.00.6727174b<br>Renamed Alvium 1800 U-030**m VSWIR** to Alvium 1800 U-030 **VSWIR**, and Alvium 1800 U-130**m VSWIR** correspondingly. |
| V3.6.0 | 2022-Mar-15 | **Release: Firmware version**: 00.08.00.6727174b<br>• Added Sensor ADC readout modes for maximum frame rates on page 77.<br>• Updated conditions for Operation for maximum frame rates on page 79 and renamed Operation for medium power consumption on page 85.<br>• Updated frame rates for model specifications tables and ROI frame rates in Alvium 1800 U model specifications on page 86.<br>• Added note about frame rates in triggered mode for Alvium 1800 U-120m/c on page 101.<br>• Corrected options for Exposure Modes in Alvium 1800 U-1240m/c on page 193.<br>• Added note for non-standard S-Mount hardware options in Sensor position accuracy on page 245.<br>• Added new section on User sets on page 248.<br>• Added Camera feature availability on page 249.<br>• Added information on Ignored triggers on page 304.<br>• Updated workflows in Image data flow on page 305 for new convolution filters, and in Value changes by feature interdependencies on page 315.<br>• dded new section Power consumption issues on page 326 and updated related<br>• Added Requirements for USB PCIe cards and host controllers on page 321.<br>• Applied minor editorial changes. |
| V3.5.1 | 2021-Nov-23 | **Firmware version**: 00.07.00.81db3896<br>• Updated links to accessories.<br>• Applied minor editorial changes. |

*Table 2: Document history (sheet 18 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.5.0 | 2021-Nov-05 | **Release: Firmware version**: 00.07.00.81db3896<br>• Added 1800 U-030m and 1800 U-130m models in Specifications on page 72 and in Lenses: Focal length vs. field of view on page 252.<br>• Updated information in Digital binning on page 81.<br>• Updated the minimum temperature value for operation and storage from +5 °C to -20 °C.<br>• Added contents for Power supply voltage for I/O cables on page 297.<br>• Updated workflow in Image data flow on page 305 for new LUT and Sharpness.<br>• Updated diagram in Value changes by feature interdependencies on page 315.<br>• Applied minor editorial changes. |
| V3.4.2 | 2021-Aug-17 | **Firmware version**: 00.06.00.35992<br>• Added icon for compliance with UKCA in Compliance notifications on page 59.<br>• Corrected sensor specifications for Alvium 1800 U-1242m/c on page 197.<br>• Applied editorial changes. |
| V3.4.1 | 2021-Aug-09 | **Firmware version**: 00.06.00.35992<br>• Adjusted conditions for Operation for maximum frame rates on page 79.<br>• Corrected binning ranges in the model specifications in Alvium 1800 U model specifications on page 86.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 19 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.4.0 | 2021-Aug-05 | **Release: Firmware version**: 00.06.00.35992<br>• Added 1800 U-120 model to Frame rate jitter on page 314 and Trigger delay with 1800 U-120 cameras on page 303.<br>• Added 1800 U-511m/c, 1800 U-811m/c, and 800 U-1242m/c models in Alvium 1800 U model specifications on page 86.<br>• For all models, added Digital binning on page 81.<br>• Updated tables with ROI frame rates in Specifications on page 72, with new bandwidth steps, extended to 450 MByte/s.<br>• Removed the previous section **Performance on reference systems** from Optimizing performance on page 314.<br>• Added instructions for DevicePowerSavingMode on page 323. |
| V3.3.0 | 2021-Apr-12 | **Release: Firmware version**: 00.04.00.34658<br>• Updated ROI frame rates on page 96 for 1800 U-120m/c models.<br>• Added 1800 U-501c NIR, 1800 U-1620m/c, 1800 U-2040m/c, and 1800 U-2460m/c models in Alvium 1800 U model specifications on page 86.<br>• Updated mass values in Standard Alvium: Dimensions and mass on page 218.<br>• Updated instructions for Mounting the camera on page 273.<br>• Applied editorial changes. |
| V3.2.2 | 2021-Jan-22 | **Firmware version**: 00.03.00.31919<br>• Updated pixel formats in Alvium 1800 U model specifications on page 86.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 20 of 23)*

| Version | Date | Remarks |
| --- | --- | --- |
| V3.2.1 | 2020-Dec-15 | **Release: Firmware version**: 00.03.00.31919<br>• Added information on the exposure time offset in Exposure time behavior regarding ExposureMode on page 78.<br>• Updated values for ROI frame rates and for minimum and maximum exposure time in Alvium 1800 U model specifications on page 86.<br>• Added values for White balance default on page 217.<br>• Updated drawings and dimension values for bare board cameras in Standard Alvium: Technical drawings on page 220.<br>• Added information about Serial numbers of Alvium® chips and bare board cameras on page 271.<br>• Added description for push-pull in GPIOs description on page 298.<br>• Added Trigger features and UserSetDefault on page 303.<br>• In Image data flow on page 305, added FPNC support for all models, except for Alvium 1800 U-2050.<br>• Added notes about frame rates for rolling shutter cameras run in triggered mode.<br>• Applied editorial changes. |
| V3.2.0 | 2020-Jul-22 | **Release: Firmware version**: 00.02.00.29974<br>• Added Alvium 1800 U-240m/c, 1800 U-508m/c, and 1800 U-1240m/c models.<br>• Updated ROI frame rates and pixel formats in Alvium 1800 U model specifications on page 86.<br>• Added QE and spectral response to Alvium 1800 U-2050m/c on page 209.<br>• Extended information in Shock and vibration on page 74.<br>• Updated spectral response graphic in IR cut filter on page 244.<br>• Added Sensor position accuracy on page 245.<br>• Added Read before use on page 2.<br>• Corrected minor errors. |

*Table 2: Document history (sheet 21 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V3.1.3 | 2020-Mar-12 | **Firmware version**: 00.01.03.29025<br>• Corrected maximum exposure times.<br>• Added `ExposureActive` signal to the description of sensor shutter modes.<br>• DPC: Removed specifications into an application note.<br>• FPNC: Updated note in Image data flow on page 305. |
| V3.1.2 | 2020-Mar-04 | **Firmware version**: 00.01.03.29025<br>Applied minor changes. |
| V3.1.1 | 2020-Feb-28 | **Firmware version**: 00.01.03.29025<br>• Updated frame rates and exposure time values.<br>• Added information about frame rates with different triggering modes. |
| V3.1.0 | 2020-Feb-20 | **Release: Firmware version**: 00.01.03.29025<br>• Added Alvium 1800 U-319m/c, 1800 U-507m/c, 1800 U-1236m/c, and 1800 U-2050m/c models.<br>• Added specifications for DPC.<br>• Updated description for sensor shutter modes. |
| V3.0.0 | 2020-Jan-06 | **Release: Firmware version**: 00.01.02.28100<br>• Added Alvium 1800 U-040m/c, 1800 U-158m/c, and 1800 U-501m NIR models. |
| V2.0.0 | 2019-Oct-18 | **Release: Firmware version**: 00.01.01.27102<br>• Added Alvium 1800 U-050m/c and 1800 U-120m/c models.<br>• Updated contents about bandwidth.<br>• Updated screenshots for camera driver installation.<br>• Added Dark current compensation on page 316.<br>• Updated technical drawings and dimensions for bare board in Standard Alvium: Technical drawings on page 220.<br>• Restructured contents in Performance and troubleshooting on page 313.<br>• Applied editorial changes. |

*Table 2: Document history (sheet 22 of 23)*

| Version | Date | Remarks |
|---|---|---|
| V1.1.0 | 2019-Jul-01 | **Firmware version**: 00.01.00.26405<br>• Added missing color pixel formats and removed separate bit depth in Specifications on page 72.<br>• Corrected ADC bit depth in specifications for Alvium 1800 U-500m/c on page 145 and in Image data flow on page 305. |
| V1.0.0 | 2019-Jun-13 | **Release: Firmware version**: 00.01.00.26405<br>Release version |

*Table 2: Document history (sheet 23 of 23)*

# Conventions used in this user guide

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

## Typographic styles

| Style | Function |
|---|---|
| **Emphasis** | Programs, or highlighting important things |
| `Feature names` | Names for GenICam features |
| *`Feature options`* | Options for GenICam features |
| ***`Input commands`*** | Text or command to type in by the user, selected menu options, or other selectable options |
| **UIElements** | Text that is displayed or output by the system, like parts of the GUI, dialog boxes, buttons, menus, important information, or windows titles |
| Web addresses and references | Links to webpages and internal cross references |

*Table 3: Typographic styles*

## Symbols and notes

**Warning**

Risk is 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**

Precautions are described

**NOTICE**

**Material damage**

Precautions are described.

**Practical tip**

Additional information helps to understand or ease handling the camera.

**Avoiding malfunctions**

Precautions are described.

**Additional information**

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

# Naming and terms

## Camera model naming

Alvium cameras are named to identify model properties.
For example, **Alvium 1800 U-500c** is composed of:

| | **Alvium** | **1800** | **U** | **500** | **c** |
|---|---|---|---|---|---|
| **Content** | Camera series | Camera series details | Interface | Resolution[1] | Color/ monochrome |
| **Examples** | Alvium | 1500: Basic feature set<br>1800: Advanced feature set or high-performance sensors | C: MIPI CSI-2<br>U: USB | 500: 5.0 MP<br>050: 0.5 MP | c: color<br>m: monochrome<br>m NIR: monochrome near infrared |
| [1]Model resolutions may slightly deviate from model naming. | | | | | |

*Table 4: Camera model naming*

## Terms and acronyms

| **Term or acronym** | **Description** | **Reference** |
|---|---|---|
| bare board | Camera consisting of electronics and sensor on a common printed circuit board (PCB), to be designed into a housing with heat sink and lens mount | Bare Board 180° (standard Alvium) on page 221 |
| CRA | Chief ray angle | Alvium 1800 U-500m/c on page 145 |
| EMVA | European Machine Vision Association | www.emva.org |
| ERS | Electronic rolling shutter, see RS | Shutter types affecting image readout on page 319 |
| ESD | Electrostatic discharge | ESD on page 65 |
| FCC | Federal Communications Commission | For customers in the USA on page 60 |
| FPNC | Pixed pattern noise correction | Image data flow on page 305 |
| fps | Frames per second | Alvium 1800 U-500m/c on page 145 |
| GenICam | Generic Interface for Cameras, EMVA | www.emva.org |
| GND | Ground (power) | I/O connector pin assignment on page 291 |
| GPIOs | General purpose inputs and outputs (non-isolated) | GPIOs description on page 298 |

*Table 5: Terms and acronyms (sheet 1 of 2)*

| Term or acronym | Description | Reference |
|---|---|---|
| GRRS | Global reset release shutter, see GRS | Shutter types affecting image readout on page 319 |
| GRS | Global reset shutter, see GRRS | Shutter types affecting image readout on page 319 |
| GS | Global shutter | Shutter types affecting image readout on page 319 |
| H × V | Horizontal × Vertical (sensor resolution) | Alvium 1800 U-500m/c on page 145 |
| KByte | Kilobyte | Alvium 1800 U-500m/c on page 145 |
| MByte/s | Megabytes per second | Alvium 1800 U-500m/c on page 145 |
| MP | Megapixels (see Px) | Alvium 1800 U model specifications on page 86 |
| open housing | Camera housing that is open at the back side to be designed into an encompassing housing with other components | Open Housing S-Mount 180° (standard Alvium) on page 225 |
| Px | Pixels (see MP) | Alvium 1800 U model specifications on page 86 |
| PCBA | Printed circuit board assembly | PCBAs on page 65 |
| QE | Quantum efficiency | Absolute QE on page 147 |
| ROI | Region of interest | ROI frame rates on page 148 |
| RS | Rolling shutter, see ERS | Shutter types affecting image readout on page 319 |
| SFNC | Standard Features Naming Convention (GenICam) | www.emva.org |
| shutter mode | Value of the `ShutterMode` feature to select between rolling shutter (RS) and global release shutter (GRS) | Frame rates with rolling shutter sensors on page 79 |
| shutter type | Sensor specific readout, such as rolling shutter (RS) or global shutter (GS) | Shutter types affecting image readout on page 319 |
| S-Mount | M12-Mount | Mounting and focusing S-Mount lenses on page 280 |

*Table 5: Terms and acronyms (sheet 2 of 2)*

Allied Vision

# Compliance, safety, and intended use

§

This chapter includes:

# Camera identification

You can identify your Alvium USB **housing camera** like this:

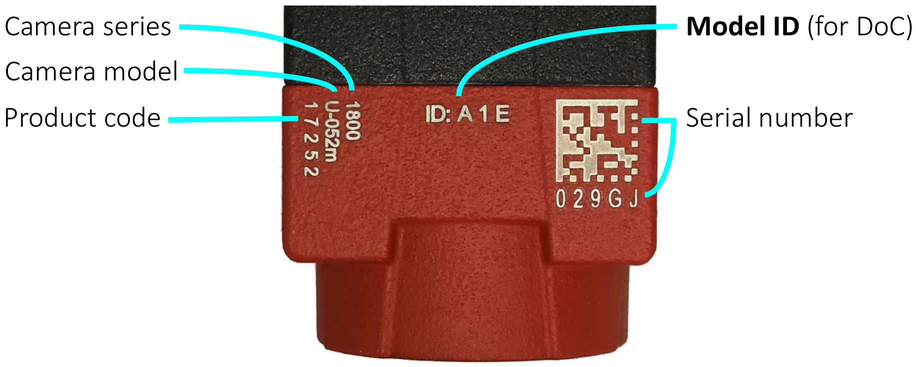



*Figure 6: Hardware options and model IDs*

## Model IDs covered by this user guide

The DoC (EU declaration of conformity) documents refer to the following hardware versions of Alvium USB cameras:

| Hardware option | Model ID |
|---|---|
| **Closed housing standard** Alvium USB | A1E |
| **Open housing standard** Alvium USB | A1D |
| **Open housing** Alvium USB **Flex** | A1N |
| **Open housing** Alvium USB **Frame** | A1D |
| **Open housing** Alvium USB **Frame Flex** | A1N |

*Table 6: Hardware options and model IDs*

Model IDs are the same for standard (180°) and 90° USB connector orientation.

# Compliance notifications

R-R-AVg-A1E

National regulations on disposal must be followed.

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

# For customers in the USA

**Closed housing cameras only: FCC Class B digital device**

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 will 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.

# United States of America: Supplier Declaration of Conformity

Alvium USB 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 - U.S. 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

**Closed housing cameras only**

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

**Boîtier de caméra fermé seulement**

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)

## Bare board and open housing cameras

Bare board cameras and open housing cameras are unfinished devices that are not EMC compliant in themselves. To meet EMC requirements, they must be appropriately housed in the customer's device and under the customer's responsibility.

**Requirements for EMC housings**

See the Electromagnetic Compatibility for Open Housing Alvium Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## 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 GPIOs 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 Alvium USB cameras safely.

## Handling lens mounts and Alvium Frame

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

The circular front opening of Alvium Frame cameras has sharp edges.

- Avoid touching these edges with your fingers.
- Wear protective gloves for handling Alvium Frame cameras with an open circular front opening.
- Follow the instructions in Installing Alvium Frame cameras on page 276.

## Handling hot cameras

If the mainboard temperature exceeds the specified maximum for more than two seconds, the camera is powered off automatically. The current value for mainboard temperature is 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

Design bare board and open housing cameras into a heat dissipative housing with a high thermal conductivity. For more information, see Mounting bare board cameras on page 273. Keep the operating temperature in the specified range to enable best image quality and to protect the camera from damage. Temperature values apply to a relative humidity of 0 to 80% that is non-condensing.

| Hardware option | Housing | Components in the cooling area[1] | Mainboard[2] |
|---|---|---|---|
| Bare board[3] | Not applicable | -20 °C to +85 °C | See model Specifications on page 72. |
| Open housing[4] | -20 °C to +65 °C | | |
| Closed housing | | Not applicable | |

[1]See Mounting the heat sink on page 272.

[2]Output by `DeviceTemperature`

[3]Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4]Temperature values must be observed for the housing **and** for the cooling area.

*Table 7: Operating temperature ranges for Alvium USB cameras*

For your safety and to improve camera performance, operate the camera:

- Mounted to a base with a high thermal conductivity
- With lens or other optical components mounted
- With a heat sink mounted that has large surface areas (closed housing cameras include a heat sink)
- Using conductive media for camera and heat sink mounting
- With active cooling of camera, mounting base, and heat sink, such as by ventilation.
- Reduce high ambient temperature. For example, in outdoor applications with direct sunlight, provide shading by an enclosure.

See Figure 7: Setup to provide optimum heat dissipation on page 64.

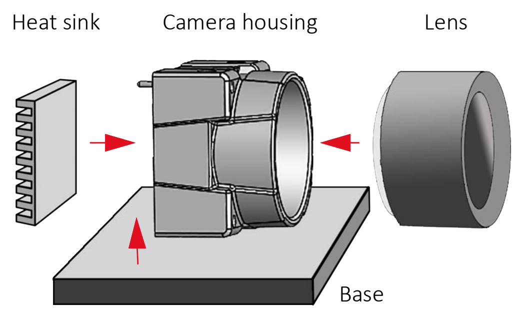



*Figure 7: Setup to provide optimum heat dissipation*

**Heat affecting your application**

Generally, image noise is increased by high operating temperatures. Therefore, we recommend you to optimize your application for heat dissipation. This is even more important with Alvium VSWIR models.

For more information on heat dissipation, see the Optimum Heat Dissipation for Housed Alvium Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

# Camera mounting

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

- Mount the camera according to the instructions in Mounting housed standard cameras on page 275.
- Ensure, shock and vibration do not exceed the specified range, see Shock and vibration on page 74.
- Use a lens support if you want to use Heavy lenses.

## Heavy lenses

For non-static applications, use lenses with a mass less than 70 grams and a length less than 38 mm, where the center of gravity is 20 mm, measured from the lens mount front flange. For heavier or longer lenses, use a lens support and apply additional tests. For more information, please contact support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

# 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 the camera, including possible **damage to the sensor**, see Possible damage to image sensors due to electrostatic discharge on page 69. ESD is dangerous for electronic devices, especially when tools or hands get in contact with connectors and electronic components. 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 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.
- Bare board and open housing cameras: use a special ESD housing.

### Cable connections

Micro USB 3.0 ports are intended for use in office applications. The USB3 Vision Standard enhances the USB 3.0 Standard by adding a screw-locking mechanism to better suit industrial applications. We recommend using only screw-lock USB cables to avoid damage to cameras, enhancing the durability and performance of cameras, and ensuring a seamless experience.

- Fasten screw-lock connectors before you start camera operation.
- Provide sufficient strain relief for all cable connections to avoid camera damage.
- Use only shielded cables to avoid electromagnetic interference.

**Compatible USB 3.0 cables**

For USB 3.0 interface cables, industrial grade, with screw locks, Standard-A to Micro-B, see www.alliedvision.com/en/products/accessories.

### PCBAs

Alvium USB cameras enable access to PCBAs. Keep away from camera electronics to avoid damage.

## Camera power

**Alvium USB Flex cameras**

Please apply the contents below depending on the camera connection of your individual application.

Operating the camera beyond the specified range damages the camera.
**Standard Alvium USB** cameras are powered over USB. Alternatively, cameras can be powered using the I/O connector at a maximum input of 5.5 VDC, using a limited power source (LPS), according to IEC 62368-1 with maximum 1.5 A. The camera is not intended to be connected to a DC distribution network.

- Make sure that USB 3.0 or 3.1 Gen 1 host controller cards, on-board host controllers, or hubs provide sufficient current supply for the connected cameras.
- Only use power supplies that meet the insulation requirement according to PELV or SELV. For details, please refer to IEC 61140.
- We recommend using powered hubs, especially for multi-camera operation.

**Alvium accessories**

For suitable USB accessories, see www.alliedvision.com/en/products/accessories.

## GPIOs

To avoid damage to the camera, keep maximum input voltage below 5.5 VDC and maximum current below 12 mA per output. See Specifications on page 72 for details. The maximum length for I/O cables must not exceed 30 meters.

### Reverse polarity

If Alvium USB cameras are externally powered with reverse polarity, the cameras can be damaged. See I/O connector pin assignment on page 291 for proper external power connections.

### JST-cables

JST I/O cables without shielding are designed to be used with bare board or open housing Alvium cameras. The customer is responsible for an EMC compliant design. For applications without an additional EMC housing, please use shielded JST I/O cables with screw lock.

## Ground loops

Unsuitable connections can lead to different potentials between the camera system GND and the environmental shield/chassis GND caused by ground loops. This can damage the camera and the connected devices or cause malfunctions.

- Avoid potential differences between the camera housing and GND.
- All wiring must be done by authorized personnel, according to the corresponding technical standards.
- You may mount the camera electrically isolated.
- Read the Avoiding Ground Loops in Vision Systems application note.

**More information**

See the Avoiding Ground Loops in Vision Systems application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## Hirose DF40C-50DP-0.4V connectors

Hirose DF40C-50DP-0.4V board-to-board connectors enable compact camera design.

The small-sized connectors are sensitive to mechanical stress and are specified for maximum 20 mating and unmating cycles. Especially if you are inexperienced with these connectors, be very cautious. If these connectors are broken, cameras must be replaced. To install and operate cameras safely, read this section carefully.

**Additional information**

For technical data and more instructions on the Hirose connectors, see the manufacturer data sheet at www.hirose.com.

## USB connections

### USB 3.0 and 3.1 Gen 1 host controllers and hubs

To avoid damage to USB 3.0 or 3.1 Gen 1 host controller cards or hubs, make sure these components provide sufficient current supply for the connected cameras. For suitable USB 3.0 accessories, see www.alliedvision.com/en/products/accessories.

If suddenly your camera is not recognized anymore, check for a crashed USB hub. Disconnect the USB and power supply cable from the hub. Reconnect both.

### USB cables

Proper cable handling enables reliable performance:

- 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.

### Alvium USB cameras and USB 2.0

If Alvium USB cameras are connected to USB 2.0 ports, they are recognized. They can be operated with reduced performance only if `DeviceLinkThroughputLimit` is set to a value supported by USB 2.0. See Host setup and bandwidth on page 320. Some pixel formats may not be supported.

**No image transfer at high bandwidths**

USB 2.0 supports maximum 50 MByte/s. If cameras require a higher bandwidth than 50 MByte/s for streaming, no image is transferred on a USB 2.0 bus. The bandwidth used by a camera results from `DeviceLinkThroughputLimit`, the image resolution, sensor characteristics, and pixel format (Mono8 has 8 bits per pixel, while RGB8 has 3 × 8 bits per pixel).

## Handling bare board cameras

Bare board cameras are an electronic assembly without a protective housing. To avoid damage:

- Handle bare board cameras with extreme care.
- Avoid any mechanical stress to the sensor area.
- Avoid short circuits by keeping away from electronics components.

Observe for mounting bare board cameras:

- Allow mechanical contact only at the mounting area. (This does not apply to the cooling area.)
- Enable proper cooling at the cooling area, see Mounting bare board cameras on page 273.
- Give 2 mm minimum clearance above board components.
- Tighten screws at 0.1 Nm maximum torque.
- Follow the instructions in Mounting bare board cameras on page 273.

## 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.

**Damage to optical components by conductive media for heat sinks**

See Conductive media for heat sinks on page 71 for details.

## 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. Alvium USB 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 as shown in Figure 8 on page 69.

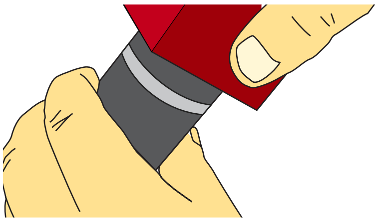


*Figure 8: Holding the camera with the lens mount facing the ground*

When no lens is mounted, protect the sensor and filter by a dust cap.

### Possible damage to image sensors due to electrostatic discharge

Generally, bare board cameras and cameras with incomplete housings are very sensitive to electrostatic discharge (ESD) as electronics components are not protected.

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.

Follow the instructions in ESD on page 65.

### Sensor cleanliness

Definitions for Alvium cameras are shown in Table 8. The incident beam is not related to the lens' angle of view.

| Sensor family | Aperture* | Incident beam | Visible particles quantity |
|---|---|---|---|
| e2v | f1/4.0 | ≥14° | 0 |
| ON Semi | f1/4.0 | ≥14° | 0 |
| Sony | f1/8.0 | ≥7° | 0 |

*Table 8: Sensor cleanliness definitions*

Alvium cameras are manufactured to match the requirements of typical machine vision applications. This enables a clean image for typical monitor view. Particles may become visible when the image is viewed critically, such as with contrast enhancement or edge detection.

**This applies to standard Alvium cameras with lens mount**: C-Mount, CS-Mount, or S-Mount (also known as M12).

**But not to additional hardware options**: Bare Board, Frame, or Flex. Sensors with RCG (Removed Cover Glass) and TCG (Taped Cover Glass), come with a tape attached by the sensor manufacturer and are not optimized for cleanliness by Allied Vision.

**Optical cleaning at Allied Vision**

Before being shipped, each camera 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/en/support/technical-documentation/alvium-usb-documentation.

**Advanced sensor cleanliness**

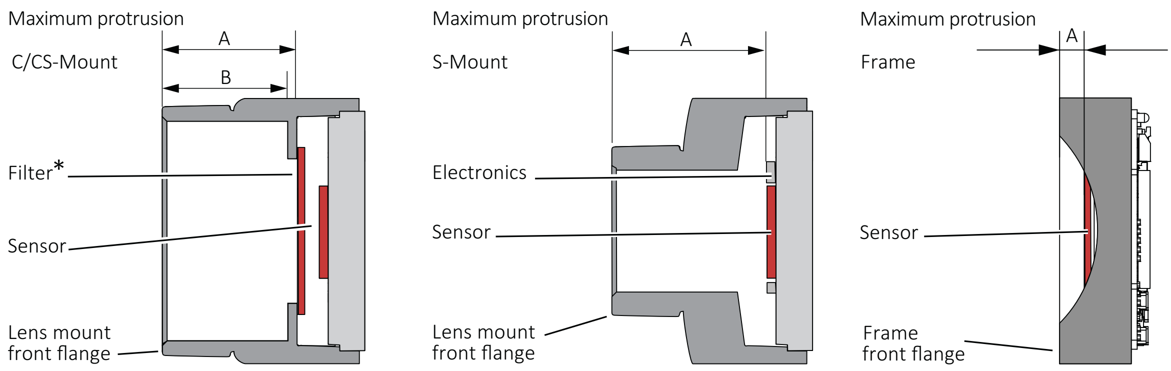
If definitions for **standard Alvium cameras with lens mount** do not fulfill the requirements of your application, please contact your Allied Vision Sales representative or visit www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

## Lenses

### Maximum protrusion

The sensor, filter, lens, or camera electronics can be damaged if an object (typically a lens) exceeding maximum protrusion is mounted to the camera. Use lenses with a maximum protrusion within camera specifications.

Figure 9 shows maximum protrusion. For details, see Maximum protrusion for front mounts on page 243.




*Only color models are equipped with an IR cut filter

*Figure 9: Maximum protrusion CS-Mount and C-Mount, S-Mount, Frame*

For S-Mount lenses, read Mounting and focusing S-Mount lenses on page 280 to avoid damage to the sensor, the electronics, and lens.

# Mechanical components

## Heat sinks

Heat sinks can be used to cool the camera for safety and to improve image quality. Adhere to the instructions provided by the manufacturer of the heat sink.

## Conductive media for heat sinks

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 **cooling area**, see Mounting the heat sink on page 272.

# BIOS drivers

Sometimes, USB component's firmware must be updated before operation, including devices, such as host adapters cards. To avoid damage and to benefit from possible updates to increase performance: Check for BIOS updates related to USB.

# Specifications

This chapter includes:

# Applied standards

## GenICam

GenICam provides a generic access for cameras and devices that is independent of the interface. This enables operating cameras with USB3 Vision, GigE Vision, or CoaXPress interfaces with a common software.

GenICam consists of multiple modules for different tasks. Allied Vision cameras and software use these modules, like the SFNC that standardizes feature names and types via an XML file or the transport layer interface (GenTL) used to grab images.

Alvium 1800 U cameras comply to:

- USB3 Vision Standard Version 1.1
- GenICam Standard Document Version 2.1.1
- GenAPI Schema Version 1.1
- GenAPI Version 3.1
- GenICam Standard Features Naming Convention (SFNC) Version 2.7
- GenICam Pixel Format Naming Convention (PFNC) Version 2.2

## USB3 Vision 1.1

USB3 Vision standard for cameras and imaging products is based on USB 3.0 standard, using USB 3.0 ports. It provides control over compliant devices by GenICam Applications Programming Interface (API). USB3 Vision standard is administered by the Automated Imaging Association (AIA).

## IP class

The following statement applies to closed housing cameras only. Equipped with a lens as intended, the Alvium USB closed housing camera complies with IP30 class according to IEC 60529.

# Shock and vibration

**Alvium USB Flex and Frame cameras**

Shock and vibration tests were done only for standard Alvium USB closed and open housing cameras. Please do your own testing for Alvium Flex or Frame cameras, depending on the individual setup.

Alvium USB closed and open housing cameras were tested according to the following standards:

- IEC 60068-2-6, sinusoidal vibration testing
- IEC 60068-2-27, 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.<br>• The connections between camera components had not come loose.<br>• 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 9: 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 | 38 mm |
| Lens dummy mass | 70 g |
| Center of gravity (CoG)[1] | 20 mm |
| [1] For camera and lens dummy assemblies, measured from the lens mount front flange | |

*Table 10: Conditions for lenses*

## IEC 60068-2-6: Sinusoidal vibration

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

*Table 11: Frequency, acceleration, and displacement for IEC 60068-2-6 tests*

| Parameter | Value |
|---|---|
| Axis | x, y, z |
| Sweep rate | 1 oct/min |
| Sweep duration per axis [hh:mm:ss] | 00:11:17 |
| Number of sweeps | 20 |

*Table 12: Other parameters for IEC 60068-2-6 tests*

## IEC 60068-2-27: Shock

| Parameter | Value |
|---|---|
| Axis | x, y, z |
| Acceleration | 20 $g^{(1)}$ |
| Number of shocks per axis | 10 |
| Duration per axis | 11 ms |
| Waveform | Half sine |
| [1] *g* = Gravity of earth | |

*Table 13: Parameters for IEC 60068-2-27 tests*

## IEC 60068-2-64: Random vibration

| Frequency | Acceleration[1] |
|---|---|
| 15 Hz to 500 Hz | 0.05 $g^2/_{\mathrm{Hz}}$ |
| [1] *g* = Gravity of earth | |

*Table 14: Frequency and acceleration for IEC 60068-2-64 tests*

| Parameter | Value |
|---|---|
| Axis | x, y, z |
| Acceleration RMS (Sigma) | 4.9 $g^{(1)}$ |
| Acceleration peak (Sigma) | 14.8 $g^{(1)}$ |
| Duration per axis [hh:mm:ss] | 00:30:00 |
| [1] *g* = Gravity of earth | |

*Table 15: Other parameters for IEC 60068-2-64 tests*

# Notes on specifications

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

## Sensor

### Measurements for QE and spectral response

Curves for quantum efficiency and for relative response show manufacturer data that has been adapted by Allied Vision’s measurements according to EMVA 1288. In some cases, no such measurements may be available. This is signaled by table captions saying **According to manufacturer data**. Please feel free to ask your Allied Vision Sales representative if you have any questions.

### Absolute QE plots

Measurements for color cameras were done with IR cut filter, measurements for monochrome and S-Mount cameras were done without optical filters. With optical filters, QE decreases by approximately 10%. The uncertainty in measurement of the QE values is ±10%. This is mainly due to uncertainties in the measuring apparatus itself (such as Ulbricht sphere and optometer).

Manufacturing tolerance of the sensor increases overall uncertainty.

#### ON Semiconductor sensors

The curve in the absolute QE plots shown in this chapter is from the sensor manufacturer data sheet. The information was correct at the time of publishing.

#### Sony sensors

Sony provides relative response curves in their sensor data sheets. To create the absolute QE plots shown in this chapter, the relative response was converted to a normalized QE response and then adjusted as per three measured QE values (at 448 nm, 529 nm, 632 nm) for color sensors and one measured QE value (at 529 nm) for monochrome sensors.

#### Wavelength

The wavelength range in the absolute QE plots reflects the information available in the sensor manufacturer data sheet at the time of publishing. For additional wavelength information, contact the sensor manufacturer.

### Spectral response plots

The curves in the spectral response plots shown in this chapter were calculated from measured quantum efficiencies at 448 nm, 529 nm, and 632 nm. The shape of the curve is taken from the sensor data sheet but the values have been adjusted based on these measured values. The uncertainty in measurement of the spectral response values is ±10%.

# Exposure time and frame rates

## Specified values

Stated values were calculated (see Operation for maximum frame rates), then verified with the test setup described in Table 16.

**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.

| Component | Property |
|---|---|
| Desktop workstation | Dell Precision T5500 Precision (EHW400) |
| Chipset | Intel X5520 |
| CPU | Intel Xeon X5670 (6 cores) |
| CPU frequency | 2.93 GHz |
| RAM | 12 GB |
| Graphics controller | NVIDIA Quadro FX 580 |
| USB controller | Delock U3 PCIe 1XG205-1S Rev. 1.1<br>(2-port USB 3.0 to PCI Express x1 Gen 2 with Renesas chipset) |
| Operating system | Windows 7 Ultimate 64-bit SP1 |
| Measured by | Oscilloscope |
| Measured signal | *`ExposureActive`* |

*Table 16: Test setup components*

## Factors for exposure time and frame rates

- The **default bandwidth** for Alvium USB cameras is 200 MByte/s. For some models, you can achieve higher frame rates by increasing values for `MaxTransferSize` and `DeviceLinkThroughputLimit`. See Host setup and bandwidth on page 320.
- Available values and increments for **exposure time** depend on other controls, such as `DeviceLinkThroughputLimit`. See Value changes by feature interdependencies on page 315.
- For **delays**, see Exposure start delay = exposure area – exposure time. on page 303.
- Calculation of maximum **frame rates for different ROIs** for Alvium USB cameras does not allow to give a formula. Operation for maximum frame rates on page 79 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 Alvium USB camera models. See your model's specifications.

By default, Alvium 1800 U 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 bit depth of the selected pixel format. 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.

**Maximum frame rates at different values for SensorBitDepth**

When the maximum bandwidth supported by USB interface is reached, reducing the value for `SensorBitDepth` does not increase the available maximum frame rate.

## Exposure time behavior regarding ExposureMode

This section informs about how exposure time behaves in the different exposure modes.

All Alvium cameras have an exposure time offset. The exposure time offset and the exposure time increment depend on sensor and camera characteristics. Both, the exposure time offset and the exposure time increment, can change if `Width`, `PixelFormat`, or `DeviceLinkThroughputLimit` are changed. See Value changes by feature interdependencies on page 315.

### ExposureMode = Timed

For all Alvium cameras, exposure time can be set by `ExposureTime` or `ExposureAuto`. For this, `ExposureMode` is set to *`Timed`*.

The selected exposure time is extended automatically:

- If the selected exposure time does not match the available increment, the camera automatically extends the exposure time to the next increment.
- The **exposure time offset is included** in the selected exposure time.

### ExposureMode = TriggerWidth or TriggerControlled

In addition, most global shutter (GS) cameras can control exposure time by the trigger signal, with the `ExposureMode` set to *`TriggerWidth`* or *`TriggerControlled`* (using *`ExposureStart`* and *`ExposureStop`*).

The trigger controlled exposure time is extended automatically:

- If the trigger controlled exposure time does not match the available increment, the camera automatically extends the exposure time to the next increment.
- Subsequently, the **exposure time offset is added**.

You can use *`ExposureActive`* to determine the duration of the exposure time offset.

# Operation for maximum frame rates

Values for maximum frame rates and for minimum and maximum exposure time in the specification tables are based on following parameters:

- Factory settings (camera after power up)
- Minimum exposure time
- Full resolution
- Mono8 pixel format or 8-Bit Bayer pixel format
- Camera operation in freerun mode
- Minimum value for `SensorBitDepth` (8-bit sensor ADC readout mode if available)
- Bandwidth required for the corresponding frame rate, as stated in the tables for ROI frame rates.

**Bandwidth**: Values were measured for 200 MByte/s, 375 MByte/s, 450 MByte/s (set by `DeviceLinkThroughputLimit`), using 8-bit, 10-bit, and 12-bit sensor ADC readout modes, depending on model abilities.
The default value for `DeviceLinkThroughputLimit` is 200 MByte/s for Alvium 1800 U cameras measured as average sensor readout. Observe that data overhead of the USB connection and on the host are included in this value. See Factors for exposure time and frame rates on page 77.

# Frame rates with rolling shutter sensors

The following table shows how the shutter mode impacts available frame rates. Reducing the area for ROI reduces readout time. The values in Table 17 apply only if exposure time is shorter than readout time.

| Sensor type | Shutter mode | Trigger mode | Frame rates at full resolution[1] | ROI frame rates |
|---|---|---|---|---|
| All models, except for... | Global shutter (GS) | Freerun | 100% | Increased values |
| | Global shutter (GS) | External trigger | 100% | |
| 1800 U-500, -501 NIR | Rolling shutter (RS) | Freerun | 100% | Increased values |
| | Rolling shutter (RS) | External trigger | >50% | |

*Table 17: Frame rates depending on shutter and trigger modes (sheet 1 of 2)*

| Sensor type | Shutter mode | Trigger mode | Frame rates at full resolution[1] | ROI frame rates |
|---|---|---|---|---|
| 1800 U-1240 | Rolling shutter (RS) | Freerun | 100% | **No increase** |
| | Rolling shutter (RS) | External trigger | >99% (2) \| >50% (3) | |
| | Global reset shutter (GRS) | Freerun | >99% | |
| | Global reset shutter (GRS) | External trigger | >99% (2) \| >50% (3) | |
| 1800 U-2050 | Rolling shutter (RS) | Freerun | 100% | Increased values |
| | Rolling shutter (RS) | External trigger | >99% (2) \| >50% (3) | |
| | Global reset shutter (GRS) | Freerun | >99% | |
| | Global reset shutter (GRS) | External trigger | >99% (2) \| >50% (3) | |
| [1] Related to the values for maximum frame rates stated in the specification tables for each model.<br>[2] Monochrome models \| [3] Color models | | | | |

*Table 17: Frame rates depending on shutter and trigger modes (sheet 2 of 2)*

**Achieved frame rates may not match specified values**

- Some sensors have an exposure start jitter that may reduce maximum frame rates.
- Your individual setup may cause delays in data transmission.

**Bandwidth adjustments**

Consider the bandwidth available for camera payload depends on your individual hardware, the operating system, software and drivers, and your application. We recommend you to adjust `DeviceLinkThroughputLimit` and `MaxTransferSize` to the capabilities of your operating system. See Host setup and bandwidth on page 320.

**Interdependencies between ROI and ExposureTime values**

Changing parameters for ROI can affect values for `ExposureTime`, such as minimum, maximum, and increments, but `ExposureTime` itself as well. We recommend you to set:

- ROI values
- `DeviceLinkThroughputLimit`

before you set values for `ExposureTime`.

See Value changes by feature interdependencies on page 315 for details.

`MaxTransferSize` can have an impact as well.

# Sensor shutter types

Differences between global shutter (GS), rolling shutter (RS), and global reset shutter (GRS) sensors are explained in Shutter types affecting image readout on page 319. Triggering behavior differs between cameras with global shutter (GS) and rolling shutter (RS). See Triggering and timings on page 301 for details.

## Brightness with 1800 U-812 UV cameras

When the sensor is exposed to light above 400 nm wavelength, the PLS (parasitic light sensitivity) effect occurs: The brightness level increases from the bottom to the top of the image.

## Digital binning

Alvium USB cameras combine digital horizontal binning and digital vertical binning, for integer values 1 to 8.

**Alvium models ≥12 MP resolution**

If digital horizontal and digital vertical binning are set to 1× and the digital vertical binning value is increased, digital horizontal binning is automatically set to 2×.

## Sensor binning

Selected camera models support sensor binning in addition to digital binning. From these models, all support ***Sum*** for binning, some also support ***Average***.
See the specifications tables in Alvium 1800 U model specifications on page 86.

**Please observe**

- Only digital binning or sensor binning can be used at a a time.
- You must revert binning values to ***1*** before you can switch between these binning modes.

## Multiple regions

All Alvium 1800 U models support single ROI (region of interest).
In `SubRegionSelector`, ***Region0*** is enabled for all camera models.
***Region0*** cannot be disabled.

Because multiple ROI (`MultipleRegions` features) are sensor based, it is not supported by all camera models. For cameras supporting more than one region, ***Region0*** to ***Region3*** can be enabled. With all the corresponding models, ***Free*** mode is available for `MultipleRegionArrangement` with 1 to 4 subregions. Other models also support ***Tile*** mode, some models also support ***Horizontal*** and ***Vertical*** mode with 1 to 4 subregions. See Table 18.

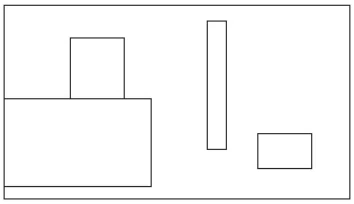
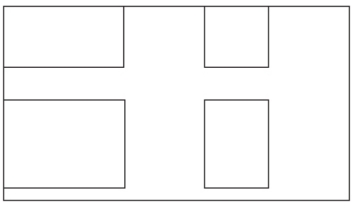
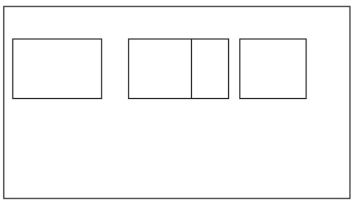
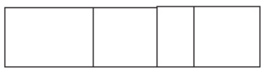
| Mode | Sensor input | Camera output |
|---|---|---|
| *Free* |  |  |
| *Tile* |  |  |
| *Horizontal* |  |  |

*Table 18: Modes for MultipleRegions (sheet 1 of 2)*

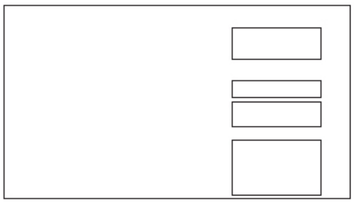
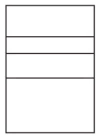
| Mode | Sensor input | Camera output |
|---|---|---|
| `Vertical` |  |  |

*Table 18: Modes for MultipleRegions (sheet 2 of 2)*

See the specifications tables in Alvium 1800 U model specifications on page 86 for `MultipleRegionArrangement` options and Available subregion resolutions on page 83.

**Using multiple regions**

Alvium Features Reference: www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## Available subregion resolutions

Table 19 shows the available total pixel resolutions when multiple regions are enabled. How are these values applied?

Alvium 1800 U-2460 supports 1 to 4 subregions in ***`Horizontal`*** mode.

**Example**
Subregions could be 608 × 8, 608 × 8, 2048 × 8, and 1920 × 8, with a minimum width of 608 pixels per subregion and a minimum height of 8 pixels.

**Minimum width for subregions**

We are working on a future solution to enable smaller width values.

The same working principle applies to ***`Vertical`*** mode correspondingly.

| Alvium model | Sensor | Minimum subregion | Maximum subregion |
|---|---|---|---|
| 1800 U-030 VSWIR | IMX991 | 8 × 8 | 656 × 520 |
| 1800 U-040 | IMX287 | 260 × 4 | 728 × 544 |
| 1800 U-050 | PYTHON 480 | Not supported | |
| 1800 U-052 | IMX426 | Not supported | |
| 1800 U-120 | AR0135 | Not supported | |
| 1800 U-130 VSWIR | IMX990 | 8 × 8 | 1296 × 1032 |

*Table 19: Available subregion resolutions (sheet 1 of 2)*

| Alvium model | Sensor | Minimum subregion | Maximum subregion |
|---|---|---|---|
| 1800 U-131 | EV76C560 | Not supported | |
| 1800 U-158 | IMX273 | 260 × 4 | 1456 × 1088 |
| 1800 U-192 | EV76C570 | Not supported | |
| 1800 U-203 | IMX422 | 16 × 8 | 1632 × 1248 |
| 1800 U-234 | IMX249 | 92 × 2 | 1936 × 1216 |
| 1800 U-235 | IMX17 | 92 × 2 | 1936 × 1216 |
| 1800 U-240 | IMX392 | 260 × 4 | 1936 × 1216 |
| 1800 U-291 | IMX421 | 16 × 8 | 1944 × 1472 |
| 1800 U-319 | IMX265 | 260 × 4 | 2064 × 1544 |
| 1800 U-320 VSWIR | IMX993 | 16 × 8 | 2080 × 1544 |
| 1800 U-500 | AR0521 | Not supported | |
| 1800 U-501 NIR | AR0522 | Not supported | |
| 1800 U-507[1] | IMX264 | 260 × 4 | 2464 × 2056 |
| 1800 U-508[1] | IMX250 | 260 × 4 | 2464 × 2056 |
| 1800 U-510 | IMX548 | 608 × 8 | 2464 × 2064 |
| 1800 U-511 | IMX547 | 608 × 8 | 2464 × 2064 |
| 1800 U-530 VSWIR | IMX992 | 16 × 8 | 2592 × 2056 |
| 1800 U-811 | IMX546 | 608 × 8 | 2848 × 2848 |
| 1800 U-812 UV | IMX487 | 608 × 16 | 2848 × 2848 |
| 1800 U-895 | IMX267 | 260 × 4 | 4112 × 2176 |
| 1800 U-1236 | IMX304 | 260 × 4 | 4112 × 3008 |
| 1800 U-1240 | IMX226 | Not supported | |
| 1800 U-1242 | IMX545 | 608 × 8 | 4128 × 3008 |
| 1800 U-1620 | IMX542 | 608 × 8 | 5328 × 3040 |
| 1800 U-2040 | IMX541 | 608 × 8 | 4512 × 4512 |
| 1800 U-2050 | IMX183 | Not supported | |
| 1800 U-2460 | IMX540 | 608 × 8 | 5328 × 4608 |
| [1] Including Pol models | | | |

*Table 19: Available subregion resolutions (sheet 2 of 2)*

# Operation for medium power consumption

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

- Factory settings (camera after power up)
- Minimum exposure time
- Maximum frame rate
- Full resolution
- Mono8 pixel format or 8-Bit Bayer pixel format
- Camera operation in freerun mode
- Sensor ADC readout using maximum bit depth
- Without bandwidth limitations.

# Dimensions and mass

For your model's dimensions, see Standard Alvium: Dimensions and mass on page 218.

In manufacturing, camera board and sensor are moved against each other to adjust flange focal distance. The value range for camera length with open housing cameras reflects in the technical drawings. See Standard Alvium: Technical drawings on page 220.

# Alvium 1800 U model specifications

## Alvium 1800 U-030 VSWIR

**Heat affecting your application**

Image noise is increased by high operating temperatures, especially with Alvium VSWIR models. Therefore, we recommend you to optimize your SWIR application for heat dissipation. For more information on heat dissipation, see the Heat Dissipation for Housed Alvium CSI-2, USB, and G1 Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

| Feature | Specification |
|---|---|
| | **1800 U-030 VSWIR** |
| Sensor model | Sony IMX991 |
| Resolution | 656 (H) × 520 (V); 0.3 MP |
| Sensor type | InGaAs |
| Shutter type | Global shutter (GS) |
| Sensor size | Type 1/4; 3.3 mm × 2.6 mm; 4.1 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 (default), Mono10, Mono10p, Mono12, Mono12p |
| Maximum frame rate | 249 fps (at ≥200 MByte/s) |
| Exposure time | 15 µs to 10 s (200 MByte/s) |
| Exposure modes | Timed, TriggerControlled, TriggerWidth |
| Gain | 0 dB to 42 dB; 0.1 dB increments |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 4 × 1 \| ***Vertical***: 1 × 1 to 1 × 4 |
| Image buffer (RAM) | 256 KByte |
| Non-volatile memory (Flash) | 1024 KByte |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA |
| Power requirements | Power over USB; External power |
| Power consumption (typical, at 5 VDC) | USB power: 2.0 W<br>External power: 2.2 W |
| Storage temperature | -20 °C to +85 °C ambient temperature |

*Table 20: Alvium 1800 U-030 VSWIR specifications (sheet 1 of 2)*

| Feature | Specification | | | |
|---|---|---|---|---|
| | 1800 U-030 VSWIR | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 20: Alvium 1800 U-030 VSWIR specifications (sheet 2 of 2)*

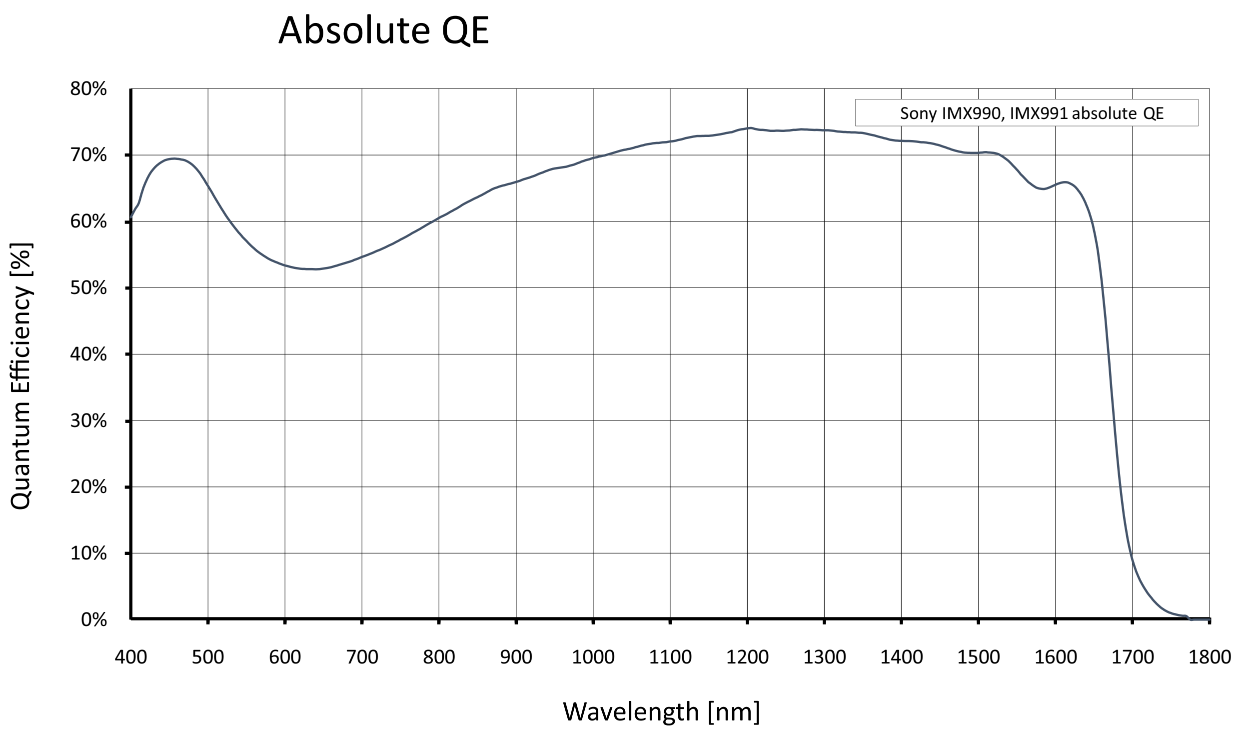



*Figure 10: Alvium 1800 U-030 VSWIR (Sony IMX991) absolute QE*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 656 | 520 | 0.341 | 249.2/231.0/133.0 | | |
| VGA | 640 | 480 | 0.307 | 267.9/248.3/143.0 | | |
| HVGA | 480 | 320 | 0.154 | 384.9/356.4/205.2 | | |
| QVGA | 320 | 240 | 0.077 | 494.1/457.2/262.7 | | |
| HQVGA | 240 | 160 | 0.038 | 683.2/634.4/365.0 | | |
| QQVGA | 160 | 120 | 0.019 | 849.9/789.2/454.6 | | |
| Max. × half | 656 | 260 | 0.171 | 450.4/416.9/241.0 | | |
| Max. × min. | 656 | 8 | 0.005 | 2340.8/2138.5/1286.8 | | |
| Min. × max. | 8 | 520 | 0.004 | 252.3/234.3/134.1 | | |
| Min. × min. | 8 | 8 | 64 Px | 2644.2/2455.3/1405.9 | | |

[1] Mono8 at `SensorBitDepth` = 8-Bit(2) / Mono10 at `SensorBitDepth` = 10-Bit / Mono12 or at `SensorBitDepth` = 12-Bit

[2] The `SensorBitDepth` value must be set separately from `PixelFormat`. See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 21: Alvium 1800 U-030 VSWIR ROI frame rates*

# Alvium 1800 U-040m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-040m (monochrome) | 1800 U-040c (color) |
| Sensor model | Sony IMX287 | |
| Resolution | 728 (H) × 544 (V); 0.4 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/2.9; 5.0 mm × 3.8 mm; 6.3 mm diagonal | |
| Pixel size | 6.9 µm × 6.9 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 494 fps (at ≥375 MByte/s) | |
| Exposure time | 20 µs to 10 s (375 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 1.9 W<br>External power: 2.1 W | |

*Table 22: Alvium 1800 U-040m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-040m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 22: Alvium 1800 U-040m/c specifications (sheet 2 of 2)*

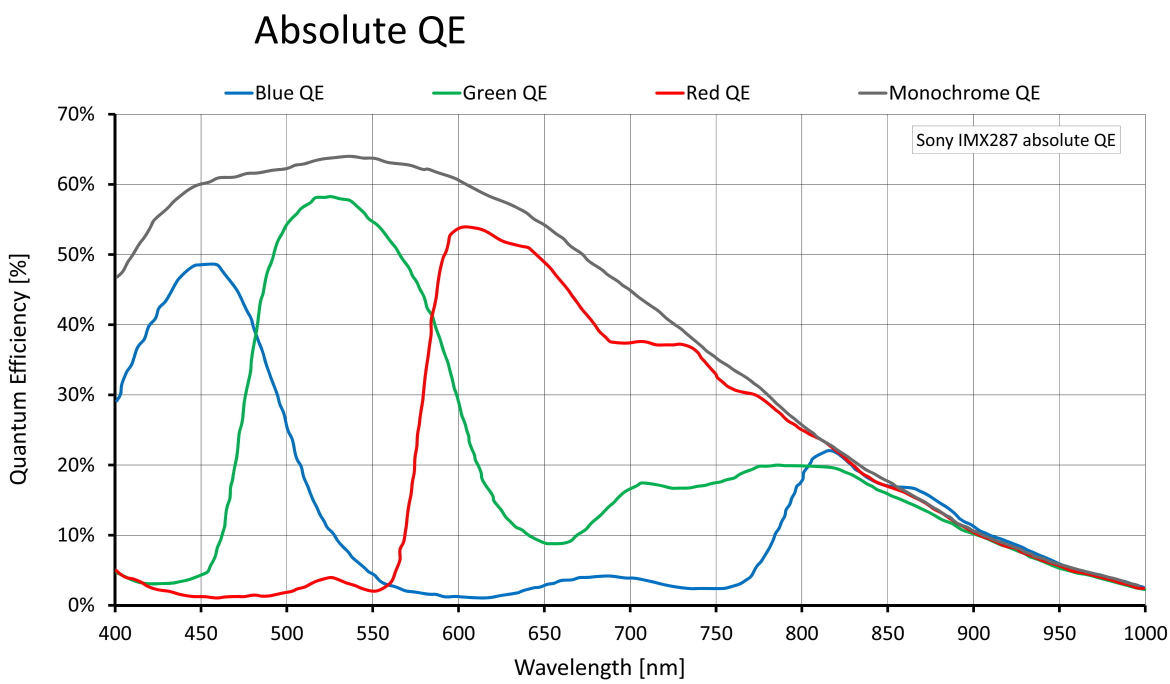



*Figure 11: Alvium 1800 U-040m/c (Sony IMX287) absolute QE*

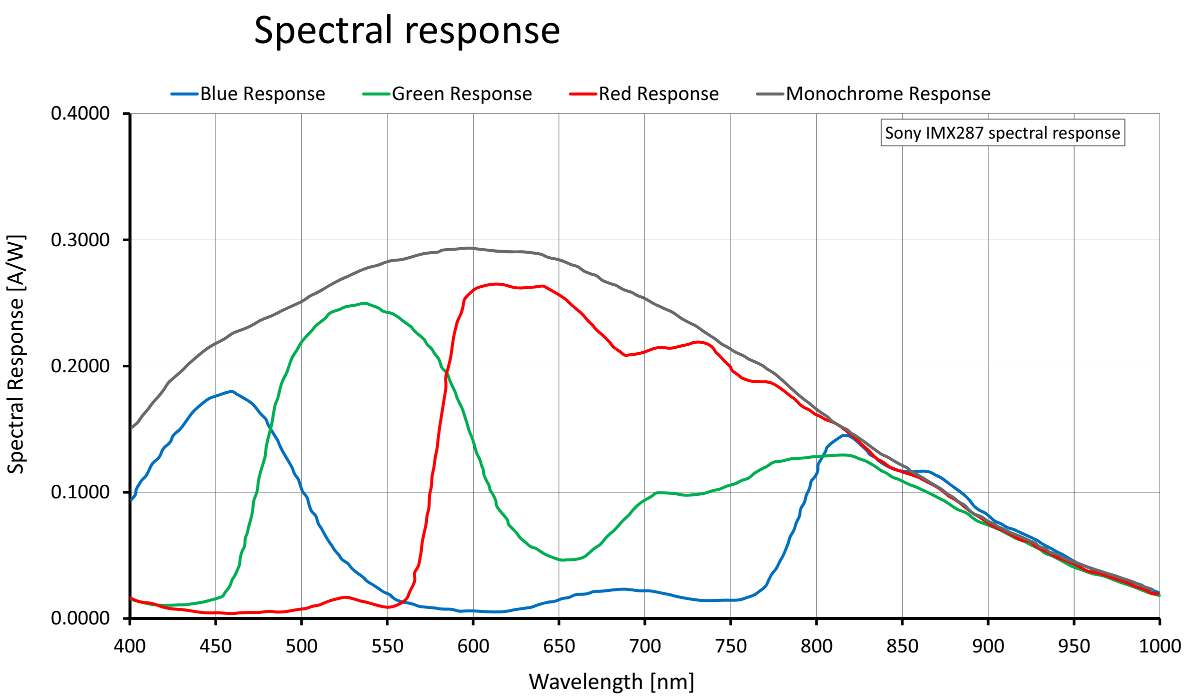



*Figure 12: Alvium 1800 U-040m/c (Sony IMX287) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 375 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 728 | 544 | 0.396 | 494.0/409.3/302.3 | | 445.3/227.3/224.0 |
| VGA | 640 | 480 | 0.307 | 553.3/458.5/338.9 | | 553.3/288.9/284.9 |
| HVGA | 480 | 320 | 0.154 | 786.3/652.1/483.5 | | 786.3/539.9/483.5 |
| QVGA | 320 | 240 | 0.077 | 991.2/833.4/617.7 | | |
| HQVGA | 240 | 160 | 0.038 | 1340.5/1138.9/847.2 | | |
| QQVGA | 160 | 120 | 0.019 | 1627.3/1390.6/1037.6 | | |
| Max. × half | 728 | 272 | 0.198 | 884.6/733.8/544.8 | | 800.5/412.9/405.9 |
| Max. × min. | 728 | 8 | 0.006 | 3803.8/3186.0/2462.7 | | 3545.1/1992.7/ 1915.3 |
| Min. × max. | 8 | 544 | 0.004 | 498.0/416.0/306.8 | | |
| Min. × min. | 8 | 8 | 64 Px | 4057.3/3647.7/2798.5 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 8-Bit[3] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 23: Alvium 1800 U-040m/c ROI frame rates*

# Alvium 1800 U-050m/c

**Supported firmware version**

Alvium 1800 U-050 models are delivered with firmware 00.11.00.9cf0c21e. The firmware version cannot be updated to later versions.

| Feature | Specification | |
|---|---|---|
| | **1800 U-050m (monochrome)** | **1800 U-050c (color)** |
| Sensor model | ON Semiconductor PYTHON 480 | |
| Resolution | 808 (H) × 608 (V); 0.5 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/3.6; 3.9 mm × 2.9 mm; 4.9 mm diagonal | |
| Pixel size | 4.8 µm × 4.8 µm | |
| CRA | 1.65 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerGR12, BayerGR12p |
| Maximum frame rate | 117 fps (at ≥200 MByte/s) | |
| Exposure time | 64 µs to 10 s (200 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 11.3 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 1.5 W<br>External power: 1.7 W | |

*Table 24: Alvium 1800 U-050m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-050m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 24: Alvium 1800 U-050m/c specifications (sheet 2 of 2)*

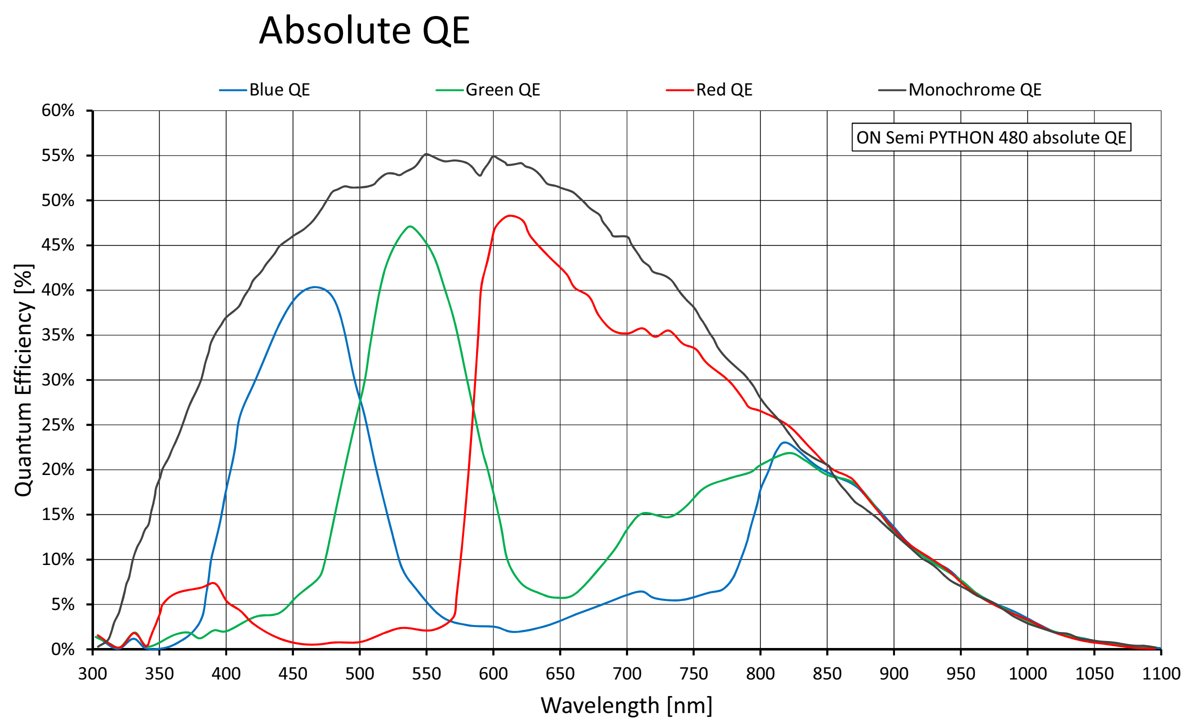



*Figure 13: Alvium 1800 U-050m/c (ON Semi PYTHON 480) absolute QE*

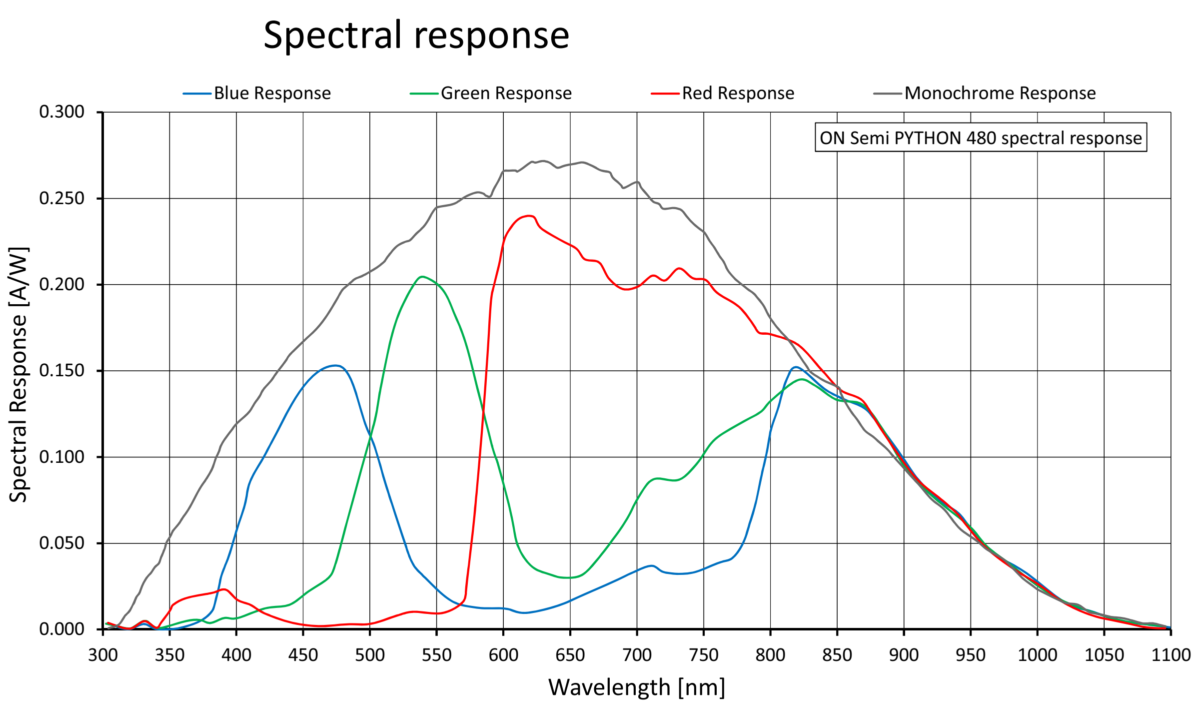



*Figure 14: Alvium 1800 U-050m/c (ON Semi PYTHON 480) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 808 | 608 | 0.491 | | 117.2/117.2 | |
| SVGA | 800 | 600 | 0.480 | | 119.7/119.7 | |
| VGA | 640 | 480 | 0.307 | | 177.0/177.0 | |
| HVGA | 480 | 320 | 0.154 | | 314.7/314.7 | |
| QVGA | 320 | 240 | 0.077 | | 517.2/517.2 | |
| HQVGA | 240 | 160 | 0.038 | | 792.0/792.0 | |
| QQVGA | 160 | 120 | 0.019 | | 1083.1/1083.1 | |
| Max. × half | 808 | 304 | 0.246 | | 220.0/220.0 | |
| Max. × min. | 808 | 8 | 0.006 | | 1501.7/1501.7 | |
| Min. × max. | 8 | 608 | 0.005 | | 732.7/732.7 | |
| Min. × min. | 8 | 8 | 64 Px | | 2035.8/2035.8 | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 25: Alvium 1800 U-050m/c ROI frame rates*

# Alvium 1800 U-052m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-052m (monochrome) | 1800 U-052c (color) |
| Sensor model | Sony IMX426 | |
| Resolution | 816 (H) × 624 (V); 0.5 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.7; 7.3 mm × 5.6 mm; 9.2 mm diagonal | |
| Pixel size | 9.0 µm × 9.0 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 688 fps (at 450 MByte/s) | |
| Exposure time | 24 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | `Free` \| `Tile` \| `Horizontal`: 1 × 1 to 4 × 1 \| `Vertical`: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 4.0 W<br>External power: 4.2 W | |

*Table 26: Alvium 1800 U-052m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-052m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 26: Alvium 1800 U-052m/c specifications (sheet 2 of 2)*

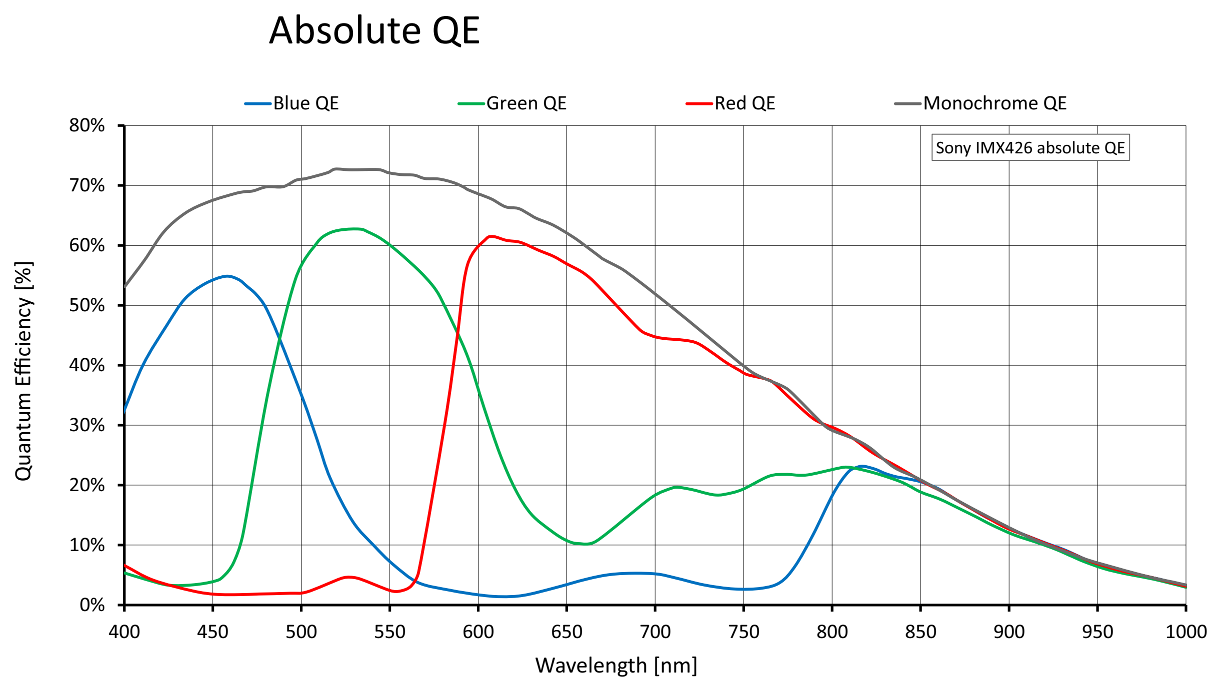



*Figure 15: Alvium 1800 U-052m/c (Sony IMX426) absolute QE*

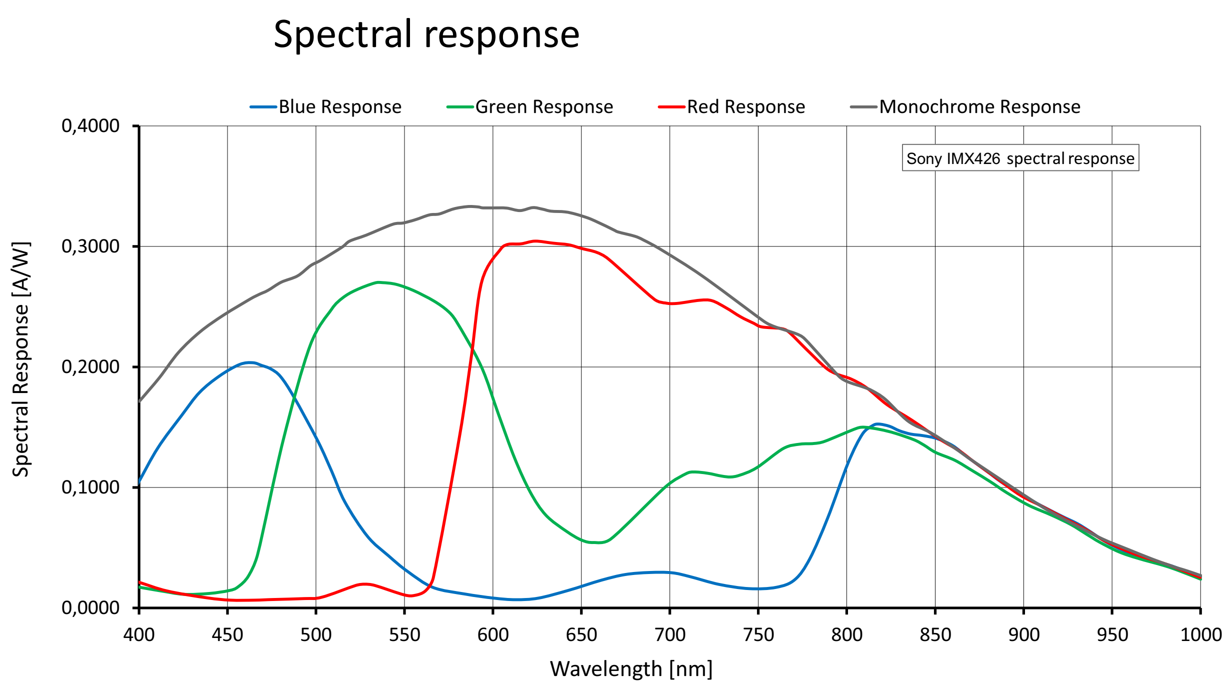



*Figure 16: Alvium 1800 U-052m/c (Sony IMX426) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 816 | 624 | 0.509 | 688.5/350.2/354.0 | 577.5/297.9/303.5 | 319.7/161.0/165.1 |
| SVGA | 800 | 600 | 0.48 | 703.6/364.2/369.6 | 603.5/309.0/316.0 | 330.4/168.6/172.2 |
| VGA | 640 | 480 | 0.307 | 851.7/548.2/556.2 | 851.7/465.9/469.5 | 497.4/255.4/258.7 |
| HVGA | 480 | 320 | 0.154 | 1151.8/955.4/849.9 | 1151.8/836.8/849.9 | 887.1/455.3/468.7 |
| QVGA | 320 | 240 | 0.077 | 1410.7/1171.9/1050.9 | | 1410.7/822.8/854.6 |
| HQVGA | 240 | 160 | 0.038 | 1801.8/1500.0/1361.7 | | 1801.8/1379.6/ 1361.7 |
| QQVGA | 160 | 120 | 0.019 | 2044.8/1698.1/1559.3 | | |
| Max. × half | 816 | 312 | 0.255 | 1116.5/578.2/ 590.0 | 943.2/493.4/508.1 | 531.0/269.3/279.7 |
| Max. × min. | 816 | 8 | 0.007 | 2951.1/1656.4/ 1769.9 | 2572.4/1436.9/ 1559.0 | 1565.7/822.4/914.4 |
| Min. × max. | 8 | 624 | 0.005 | 721.2/596.8/524.7 | | 721.2/596.8/524.7 |
| Min. × min. | 8 | 8 | 64 Px | 3664.1/3082.2/2997.8 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 8-Bit[(3)] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 27: Alvium 1800 U-052m/c ROI frame rates*

# Alvium 1800 U-120m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-120m (monochrome) | 1800 U-120c (color) |
| Sensor model | ON Semiconductor AR0135CS | |
| Resolution | 1280 (H) × 960 (V); 1.2 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/3; 4.8 mm × 3.6 mm; 6.0 mm diagonal | |
| Pixel size | 3.75 µm × 3.75 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 52 fps[1] (at ≥200 MByte/s) | |
| Exposure time | 57 µs to 8 s (200 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 17.7 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 1.3 W<br>External power: 1.5 W | |
| [1] In triggered mode, maximum frame rates require minimum exposure times. | | |

*Table 28: Alvium 1800 U-120m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-120m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
</table>

[1] See Mounting the heat sink on page 272.

[2] Output by `DeviceTemperature`

[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 28: Alvium 1800 U-120m/c specifications (sheet 2 of 2)*

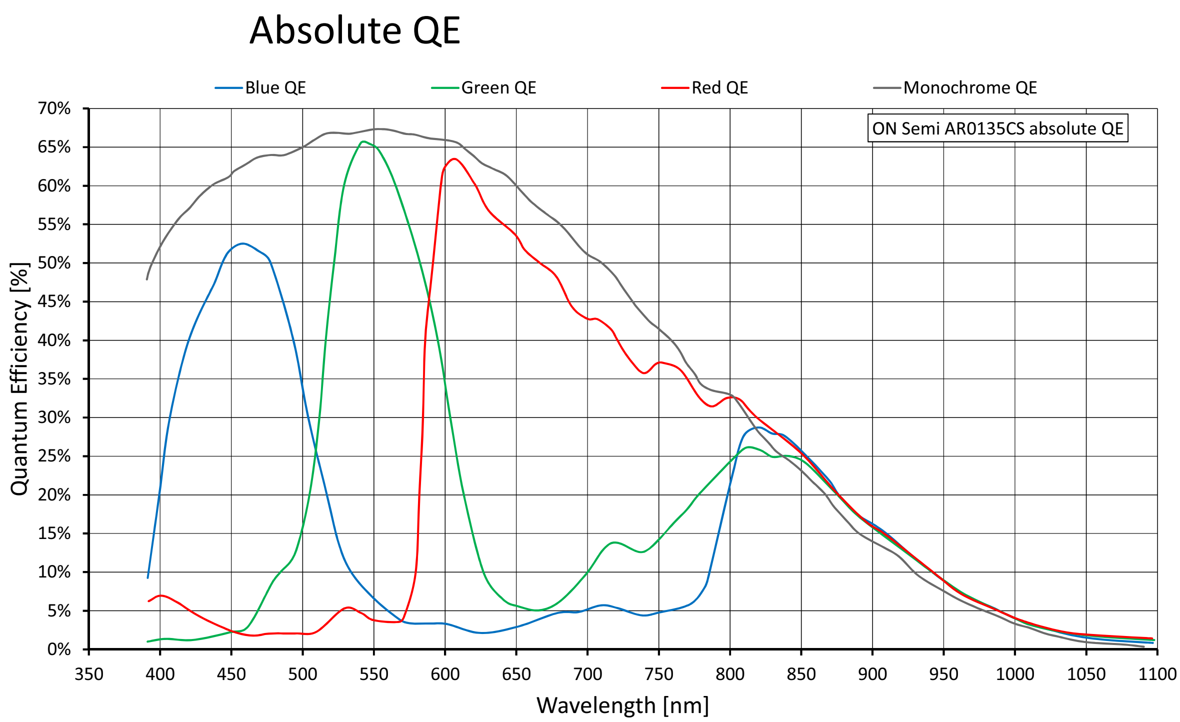



*Figure 17: Alvium 1800 U-120m/c (ON Semi AR0135CS) absolute QE*

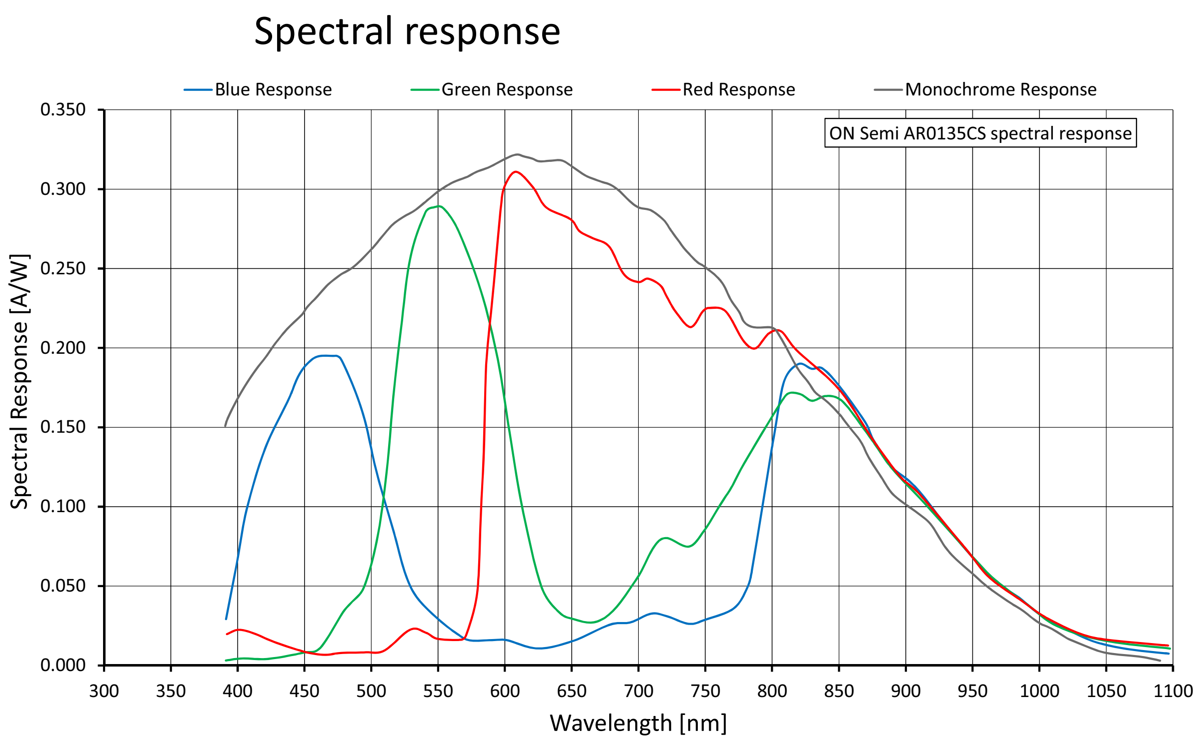



*Figure 18: Alvium 1800 U-120m/c (ON Semi AR0135CS) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

Alvium 1800 U-120 cameras do not allow overlapping of exposure and readout. **In triggered mode**, the maximum available frame rates may be reduced with long exposure times.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1280 | 960 | 1.229 | 52.8/52.8 | | |
| HD 720 | 1280 | 720 | 0.922 | 69.2/69.3 | 69.3/69.3 | |
| XGA | 1024 | 768 | 0.786 | 65.2/65.2 | | |
| SVGA | 800 | 600 | 0.48 | 82.0/82.0 | | |
| VGA | 640 | 480 | 0.307 | 100.5/100.5 | | |
| HVGA | 480 | 320 | 0.154 | 143.8/143.8 | | |
| QVGA | 320 | 240 | 0.077 | 161.2/161.2 | | |
| HQVGA | 240 | 160 | 0.038 | 161.2/161.2 | | |
| QQVGA | 160 | 120 | 0.019 | 161.2/161.2 | | |
| Max. × half | 1280 | 480 | 0.614 | 100.5/100.5 | | |
| Max. × min. | 1280 | 8 | 0.01 | 160.9/160.9 | | |
| Min. × max. | 8 | 960 | 0.008 | 52.9/52.9 | | |
| Min. × min. | 8 | 8 | 64 Px | 161.2/161.2 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 29: Alvium 1800 U-120m/c ROI frame rates*

# Alvium 1800 U-130 VSWIR

**Heat affecting your application**

Image noise is increased by high operating temperatures, especially with Alvium VSWIR models. Therefore, we recommend you to optimize your SWIR application for heat dissipation. For more information on heat dissipation, see the Heat Dissipation for Housed Alvium CSI-2, USB, and G1 Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

| Feature | Specification |
|---|---|
| | **1800 U-130 VSWIR** |
| 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 (default), Mono10, Mono10p, Mono12, Mono12p |
| Maximum frame rate | 130 fps (at ≥200 MByte/s) |
| Exposure time | 15 µs to 10 s (200 MByte/s) |
| Exposure modes | Timed, TriggerControlled, TriggerWidth |
| Gain | 0 dB to 42 dB; 0.1 dB increments |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows |
| Multiple ROI (H × V) | *Free* \| *Tile* \| *Horizontal*: 1 × 1 to 1 × 4 \| *Vertical*: 1 × 1 to 1 × 4 |
| Image buffer (RAM) | 256 KByte |
| Non-volatile memory (Flash) | 1024 KByte |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA |
| Power requirements | Power over USB; External power |
| Power consumption (typical, at 5 VDC) | USB power: 2.1 W<br>External power: 2.3 W |

*Table 30: Alvium 1800 U-130 VSWIR specifications (sheet 1 of 2)*

| Feature | Specification | | | |
|---|---|---|---|---|
| | 1800 U-130 VSWIR | | | |
| Storage temperature | -20 °C to +85 °C ambient temperature | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 30: Alvium 1800 U-130 VSWIR specifications (sheet 2 of 2)*

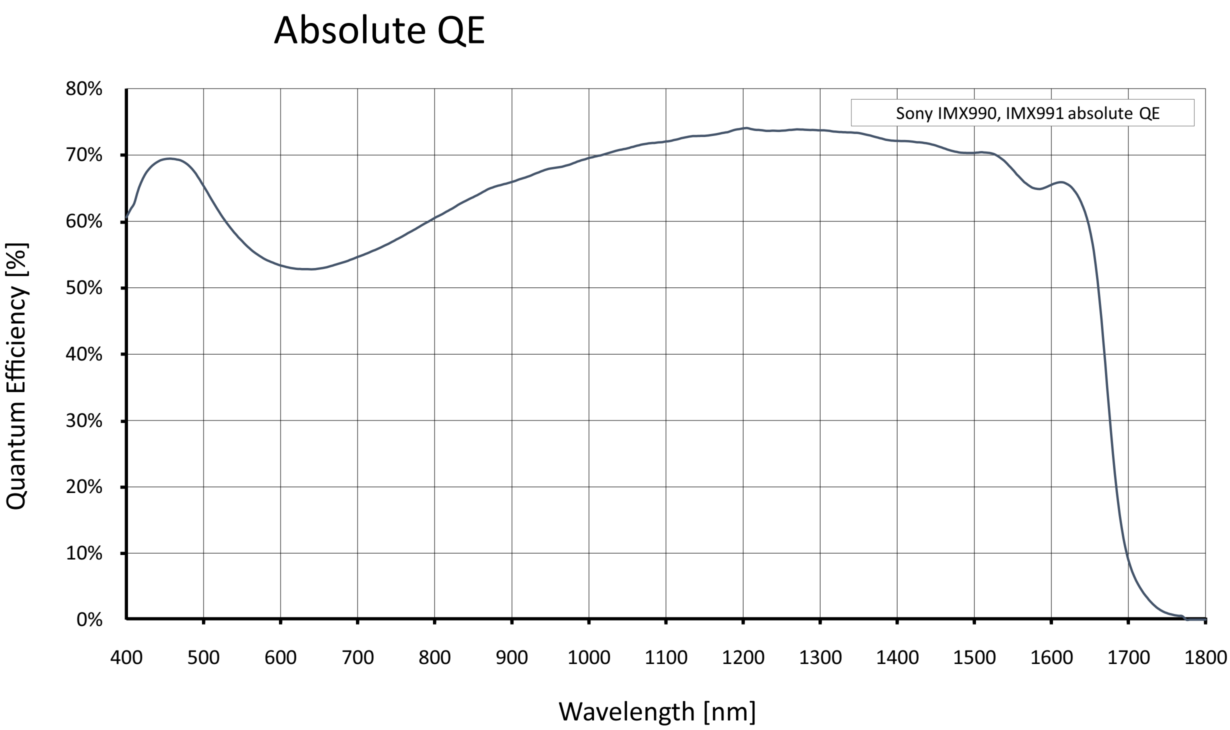



*Figure 19: Alvium 1800 U-130 VSWIR (Sony IMX990) absolute QE*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1296 | 1032 | 1.337 | 130.9/121.3/69.8 | | 130.9/70.8/69.8 |
| SXGA | 1280 | 1024 | 1.311 | 131.8/122.2/70.3 | | 131.8/72.4/70.3 |
| HD 720 | 1280 | 720 | 0.922 | 183.3/169.8/97.8 | | 183.3/100.8/97.8 |
| XGA | 1024 | 768 | 0.786 | 173.1/160.5/92.4 | | 173.1/118.7/92.4 |
| SVGA | 800 | 600 | 0.48 | 218.3/202.1/116.4 | | 218.3/190.5/116.4 |
| VGA | 640 | 480 | 0.307 | 267.9/248.3/143.0 | | 267.9/248.3/143.0 |
| HVGA | 480 | 320 | 0.154 | 384.9/356.4/205.2 | | |
| QVGA | 320 | 240 | 0.077 | 494.1/457.2/262.7 | | |
| HQVGA | 240 | 160 | 0.038 | 683.2/634.4/365.0 | | |
| QQVGA | 160 | 120 | 0.019 | 849.9/789.2/454.6 | | |
| Max. × half | 1296 | 516 | 0.669 | 246.6/228.2/131.8 | | |
| Max. × min. | 1296 | 8 | 0.01 | 2131.1/1921.6/1186.2 | | |
| Min. × max. | 8 | 1032 | 0.008 | 132.5/123.0/70.4 | | |
| Min. × min. | 8 | 8 | 64 Px | 2644.2/2455.3/1405.9 | | |

[1] Mono8 at `SensorBitDepth` = 8-Bit[(2)] / Mono10 at `SensorBitDepth` = 10-Bit / Mono12 or at `SensorBitDepth` = 12-Bit

[2] The `SensorBitDepth` value must be set separately from `PixelFormat`. See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 31: Alvium 1800 U-130 VSWIR ROI frame rates*

# Alvium 1800 U-131m/c

**White balance with this Alvium model**

Especially with long exposure times, bright image areas of e2v EV76C560 Saphire sensors may appear slightly violet: At maximum saturation, the output for red and green is 255 as expected, while the output for green drops down to approximately 240. Therefore, we recommend to slightly underexpose images to reduce this effect.

| Feature | Specification | |
|---|---|---|
| | 1800 U-131m (monochrome) | 1800 U-131c (color) |
| Sensor model | e2v EV76C560 Saphire | |
| Resolution | 1280 (H) × 1024 (V); 1.3 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.8; 6.9 mm × 5.5 mm; 8.7 mm diagonal | |
| Pixel size | 5.3 µm × 5.3 µm | |
| CRA | 12 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 60 fps (at ≥200 MByte/s) | |
| Exposure time | 16 µs to 1 s (200 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 12.5 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |

*Table 32: Alvium 1800 U-131m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-131m/c</th></tr>
<tr><td>Power requirements</td><td colspan="4">Power over USB; External power</td></tr>
<tr><td>Power consumption<br>(typical, at 5 VDC)</td><td colspan="4">USB power: 1.5 W<br>External power: 1.5 W</td></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 32: Alvium 1800 U-131m/c specifications (sheet 2 of 2)*

## Absolute QE, spectral response

We intend to add diagrams in a future version of this document.

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution, SXGA | 1280 | 1024 | 1,311 | | 60.7/60.7 | |
| SXGA | 1280 | 1024 | 1,311 | | 60.7/60.7 | |
| HD 720 | 1280 | 720 | 0,922 | | 85.6/85.6 | |
| XGA | 1024 | 768 | 0,786 | | 80.4/80.4 | |
| SVGA | 800 | 600 | 0,48 | | 102.1/102.1 | |
| VGA | 640 | 480 | 0,307 | | 126.4/126.4 | |
| HVGA | 480 | 320 | 0,154 | | 185.4/185.4 | |
| QVGA | 320 | 240 | 0,077 | | 241.8/241.8 | |
| HQVGA | 240 | 160 | 0,038 | | 347.4/347.4 | |
| QQVGA | 160 | 120 | 0,019 | | 444.5/444.5 | |
| Max. × half | 1280 | 512 | 0,655 | | 118.9/118.9 | |
| Max. × min. | 1280 | 8 | 0,01 | | 2046.2/2046.2 | |
| Min. × max. | 8 | 1024 | 0,008 | | 60.7/60.7 | |
| Min. × min. | 8 | 8 | 64 Px | | 2046.3/2046.3 | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit[(3)] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 33: Alvium 1800 U-131m/c ROI frame rates*

# Alvium 1800 U-158m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-158m (monochrome)** | **1800 U-158c (color)** |
| Sensor model | Sony IMX273 | |
| Resolution | 1456 (H) × 1088 (V); 1.6 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/2.9; 5.0 mm × 3.8 mm; 6.3 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 257 fps (at 450 MByte/s) | |
| Exposure time | 28 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 1 × 2, 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | *Free* \| *Tile* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.5 W<br>External power: 2.6 W | |

*Table 34: Alvium 1800 U-158m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-158m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 34: Alvium 1800 U-158m/c specifications (sheet 2 of 2)*

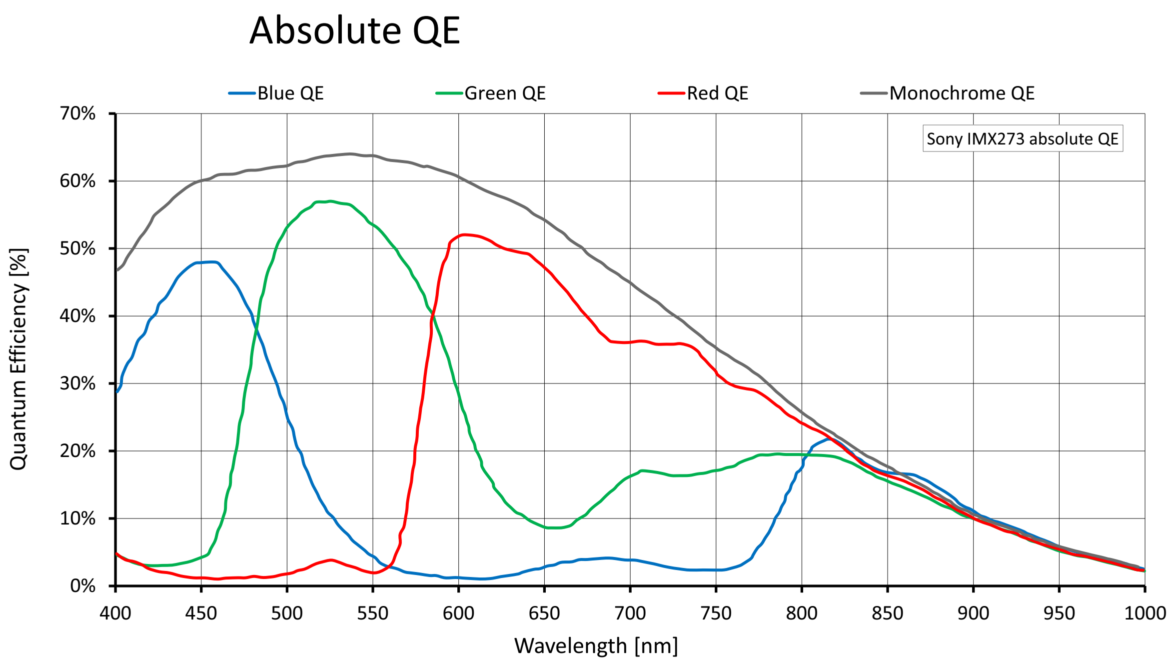



*Figure 20: Alvium 1800 U-158m/c (Sony IMX273) absolute QE*

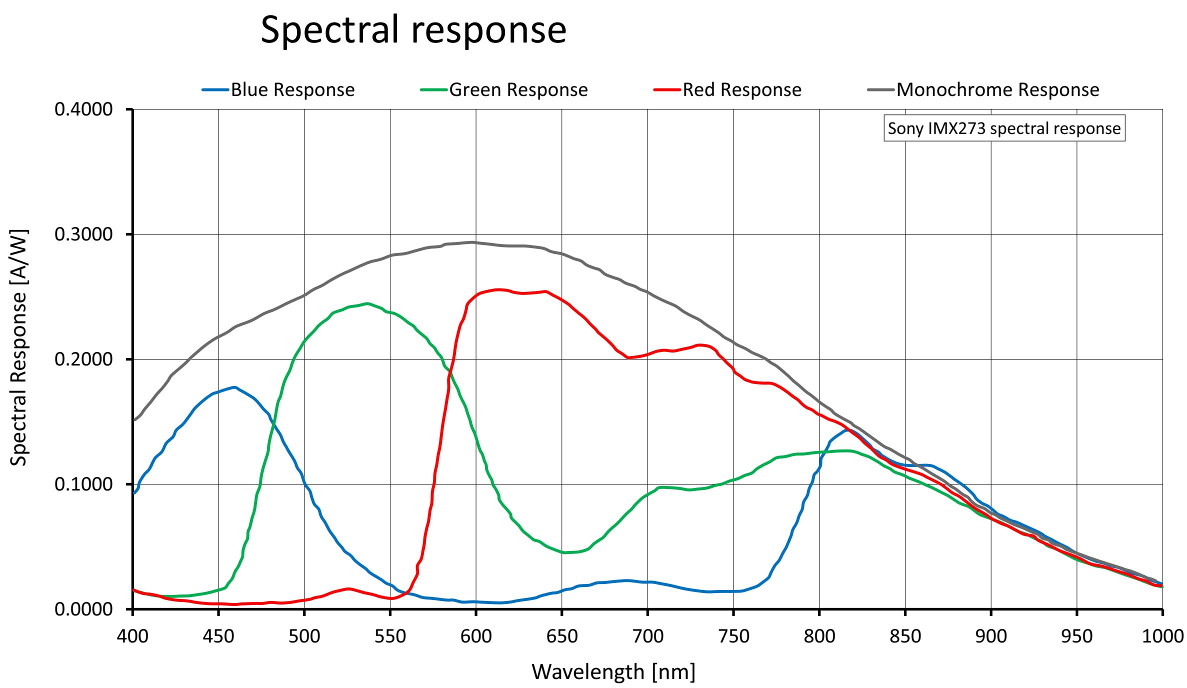



*Figure 21: Alvium 1800 U-158m/c (Sony IMX273) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1456 | 1088 | 1.584 | 257.9/130.3/130.8 | 216.8/110.5/109.7 | 118.1/59.8/59.3 |
| WXGA+ | 1440 | 900 | 1.296 | 311.9/158.7/157.8 | 261.7/134.2/133.6 | 143.1/72.1/71.7 |
| SXGA | 1280 | 1024 | 1.311 | 278.2/157.1/155.7 | 261.3/133.0/132.5 | 142.8/72.0/71.5 |
| HD 720 | 1280 | 720 | 0.922 | 382.9/217.2/214.8 | 359.8/184.1/183.1 | 198.0/99.9/99.3 |
| XGA | 1024 | 768 | 0.786 | 364.0/255.0/218.8 | 364.0/215.8/215.9 | 233.4/117.7/117.1 |
| SVGA | 800 | 600 | 0.48 | 457.6/372.9/275.3 | 457.6/344.8/275.3 | 368.8/188.5/188.2 |
| VGA | 640 | 480 | 0.307 | 560.5/456.8/337.7 | | 560.5/288.4/284.3 |
| HVGA | 480 | 320 | 0.154 | 795.3/650.4/482.2 | | 795.3/538.5/482.2 |
| QVGA | 320 | 240 | 0.077 | 1001.2/830.7/615.7 | | |
| HQVGA | 240 | 160 | 0.038 | 1351.0/1138.9/847.2 | | |
| QQVGA | 160 | 120 | 0.019 | 1636.9/1390.6/1037.6 | | |
| Max. × half | 1456 | 544 | 0.792 | 478.5/244.8/244.8 | 404.3/208.2/206.1 | 223.0/113.4/112.4 |
| Max. × min. | 1456 | 8 | 0.012 | 3043.0/1825.6/1736.1 | 2734.2/1620.4/1537.1 | 1795.9/982.1/949.6 |
| Min. × max. | 8 | 1088 | 0.009 | 267.4/219.1/161.2 | | |
| Min. × min. | 8 | 8 | 64 Px | 4017.8/3647.7/2798.5 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 8-Bit[3] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 35: Alvium 1800 U-158m/c ROI frame rates*

# Alvium 1800 U-192m/c

**White balance with this Alvium model**

Especially with long exposure times, bright image areas of e2v EV76C570 Saphire sensors may appear slightly violet: At maximum saturation, the output for red and green is 255 as expected, while the output for green drops down to approximately 240. Therefore, we recommend to slightly underexpose images to reduce this effect.

| Feature | Specification | |
|---|---|---|
| | 1800 U-192m (monochrome) | 1800 U-192c (color) |
| Sensor model | e2v EV76C570 Saphire | |
| Resolution | 1600 (H) × 1200 (V); 1.92 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.8; 7.2 mm × 5.4 mm; 9.0 mm diagonal | |
| Pixel size | 4.5 µm × 4.5 µm | |
| CRA | 12 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 59 fps (at ≥200 MByte/s) | |
| Exposure time | 14 µs to 0.8 s (200 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 12.5 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |

*Table 36: Alvium 1800 U-192m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-192m/c</th></tr>
<tr><td>Power requirements</td><td colspan="4">Power over USB; External power</td></tr>
<tr><td>Power consumption<br>(typical, at 5 VDC)</td><td colspan="4">USB power: 1.6 W<br>External power: 1.6 W</td></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 36: Alvium 1800 U-192m/c specifications (sheet 2 of 2)*

## Absolute QE, spectral response

We intend to add diagrams in a future version of this document.

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s.

<table>
<tr><th rowspan="2">Image format</th><th rowspan="2">Width [pixels]</th><th rowspan="2">Height [pixels]</th><th rowspan="2">ROI area [MP]</th><th colspan="3">Frame rate [fps][1]</th></tr>
<tr><th>450 MByte/s</th><th>375 MByte/s</th><th>200 MByte/s</th></tr>
<tr><td>Full resolution</td><td>1600</td><td>1200</td><td>1,92</td><td colspan="2">59.5/59.5</td><td>59.5/51.1</td></tr>
<tr><td>UXGA</td><td>1600</td><td>1200</td><td>1,92</td><td colspan="2">59.5/59.5</td><td>59.5/51.1</td></tr>
<tr><td>WXGA+</td><td>1440</td><td>900</td><td>1,296</td><td colspan="2">79.6/79.6</td><td>79.6/75.2</td></tr>
<tr><td>SXGA</td><td>1280</td><td>1024</td><td>1,311</td><td colspan="2">70.2/70.2</td><td>70.2/70.2</td></tr>
<tr><td>HD 720</td><td>1280</td><td>720</td><td>0,922</td><td colspan="3">98.9/98.9</td></tr>
<tr><td>XGA</td><td>1024</td><td>768</td><td>0,786</td><td colspan="3">92.9/92.9</td></tr>
<tr><td>SVGA</td><td>800</td><td>600</td><td>0,48</td><td colspan="3">117.9/117.9</td></tr>
<tr><td>VGA</td><td>640</td><td>480</td><td>0,307</td><td colspan="3">145.9/145.9</td></tr>
<tr><td>HVGA</td><td>480</td><td>320</td><td>0,154</td><td colspan="3">213.9/213.9</td></tr>
<tr><td>QVGA</td><td>320</td><td>240</td><td>0,077</td><td colspan="3">278.7/278.7</td></tr>
<tr><td>HQVGA</td><td>240</td><td>160</td><td>0,038</td><td colspan="3">400.0/400.0</td></tr>
<tr><td>QQVGA</td><td>160</td><td>120</td><td>0,019</td><td colspan="3">511.2/511.2</td></tr>
<tr><td>Max. × half</td><td>1600</td><td>600</td><td>0,96</td><td colspan="3">116.7/116.7</td></tr>
<tr><td>Max. × min.</td><td>1600</td><td>8</td><td>0,013</td><td colspan="3">2288.7/2288.7</td></tr>
<tr><td>Min. × max.</td><td>8</td><td>1200</td><td>0,01</td><td colspan="3">60.1/60.1</td></tr>
<tr><td>Min. × min.</td><td>8</td><td>8</td><td>64 Px</td><td colspan="3">2310.8/2310.8</td></tr>
<tr><td colspan="7">[1] Mono8 or Bayer...8[(2)] at <code>SensorBitDepth</code> = 8-Bit[(3)] /<br>Mono10 or Bayer...10 at <code>SensorBitDepth</code> = 10-Bit<br>[2] The three dots... represent the colors of a Bayer pixel format, such as in BayerRG8.<br>[3] The <code>SensorBitDepth</code> value must be set separately from <code>PixelFormat</code>.<br>See Sensor ADC readout modes for maximum frame rates on page 77 for details.</td></tr>
</table>

*Table 37: Alvium 1800 U-192m/c ROI frame rates*

# Alvium 1800 U-203m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-203m (monochrome) | 1800 U-203c (color) |
| Sensor model | IMX422 | |
| Resolution | 1632 (H) × 1248 (V); 2.03 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.7; 7.3 mm × 5.6 mm; 9.2 mm diagonal | |
| Pixel size | 4.5 µm × 4.5 µm | |
| CRA | 0° deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 200 fps (at 450 MByte/s) | |
| Exposure time | 16 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (***Sum***, ***Average***) | Not applicable |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.3 W<br>External power: 3.3 W | |

*Table 38: Alvium 1800 U-203m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-203m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 38: Alvium 1800 U-203m/c specifications (sheet 2 of 2)*

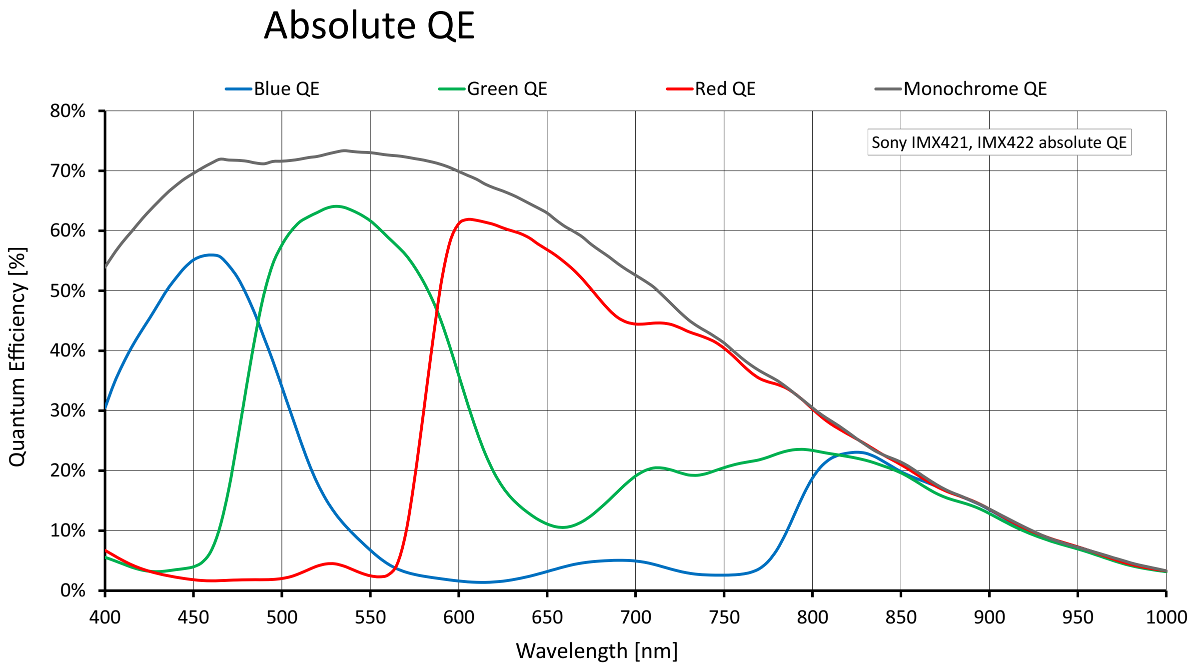



*Figure 22: Alvium 1800 U-203m/c (Sony IMX422) absolute QE*

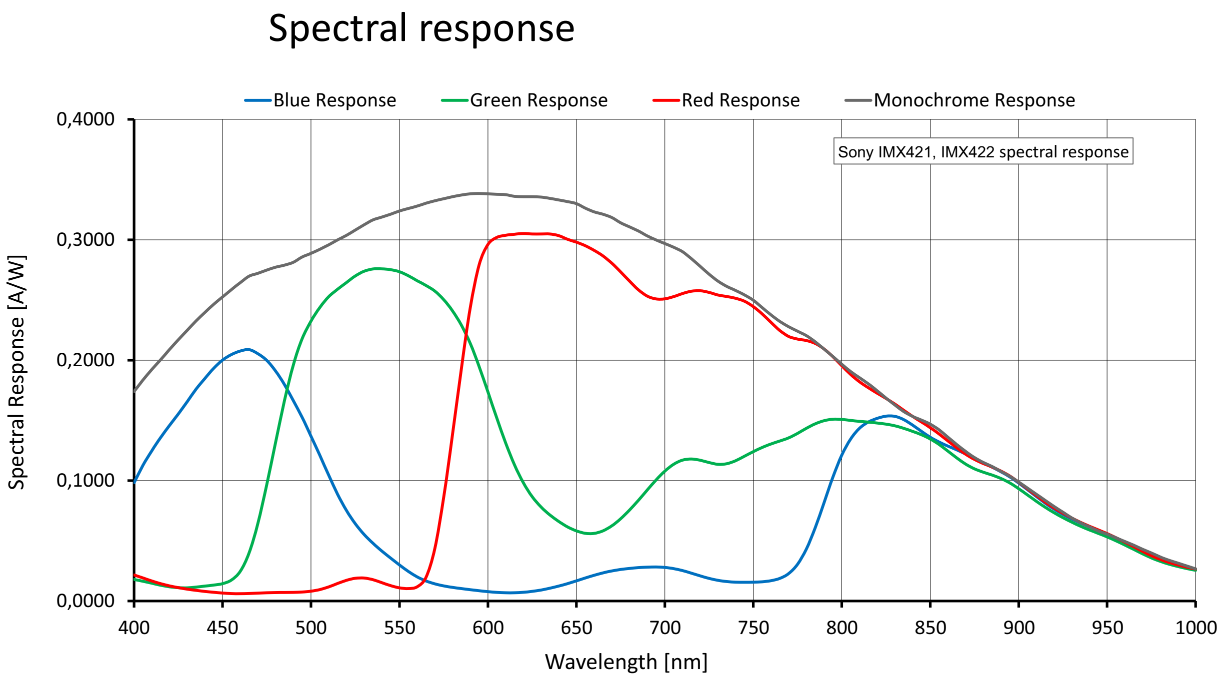



*Figure 23: Alvium 1800 U-203m/c (Sony IMX422) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1632 | 1248 | 2.037 | 200.0/101.0/100.7 | 168.8/84.9/85.2 | 91.0/45.7/45.9 |
| WXGA+ | 1440 | 900 | 1.296 | 302.7/153.9/153.8 | 254.0/130.1/130.1 | 138.8/70.0/69.8 |
| SXGA | 1280 | 1024 | 1.311 | 271.9/153.5/152.6 | 255.3/129.9/129.9 | 139.5/70.3/70.1 |
| HD 720 | 1280 | 720 | 0.922 | 370.9/210.3/209.1 | 348.6/178.2/178.2 | 191.6/96.7/96.6 |
| XGA | 1024 | 768 | 0.786 | 353.2/247.4/245.0 | 353.2/209.4/210.4 | 226.4/114.1/114.1 |
| SVGA | 800 | 600 | 0.48 | 440.7/359.0/306.1 | 440.7/331.9/306.1 | 355.1/181.4/182.2 |
| VGA | 640 | 480 | 0.307 | 535.2/436.2/373.0 | 535.2/436.2/373.0 | 535.2/275.2/273.3 |
| HVGA | 480 | 320 | 0.154 | 747.3/609.4/522.9 | | 747.3/504.3/505.5 |
| QVGA | 320 | 240 | 0.077 | 937.5/765.0/658.5 | | |
| HQVGA | 240 | 160 | 0.038 | 1247.5/1019.0/881.7 | | |
| QQVGA | 160 | 120 | 0.019 | 1501.8/1227.8/1066.8 | | |
| Max. × half | 1632 | 624 | 1.018 | 368.4/187.9/187.3 | 312.2/158.4/158.9 | 170.1/85.8/86.3 |
| Max. × min. | 1632 | 8 | 0.013 | 2183.8/1249.9/ 1236.2 | 1942.1/1087.9/ 1091.3 | 1197.3/636.6/651.7 |
| Min. × max. | 8 | 1248 | 0.01 | 232.6/189.4/161.1 | | |
| Min. × min. | 8 | 8 | 64 Px | 3437.4/2828.0/2540.0 | | |

[1] Mono8 or Bayer...8(2) at `SensorBitDepth` = 8-Bit(3) /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 39: Alvium 1800 U-203m/c ROI frame rates*

# Alvium 1800 U-234m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-234m | 1800 U-234c |
| Sensor model | Sony IMX249 | |
| Resolution | 1936 (H) × 1216 (V); 2.35 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.2; 11.3 mm × 7.1 mm; 13.4 mm diagonal | |
| Pixel size | 5.86 µm × 5.86 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 40 fps (at ≥200 MByte/s) | |
| Exposure time | 34 µs to 10 s (200 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.1 W<br>External power: 2.3 W | |

*Table 40: Alvium 1800 U-234m/c specifications (sheet 1 of 2)*

| Feature | Specification | | | |
|---|---|---|---|---|
| | 1800 U-234m/c | | | |
| Storage temperature | -20 °C to +85 °C ambient temperature | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.

[2] Output by `DeviceTemperature`

[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 40: Alvium 1800 U-234m/c specifications (sheet 2 of 2)*

## Absolute QE

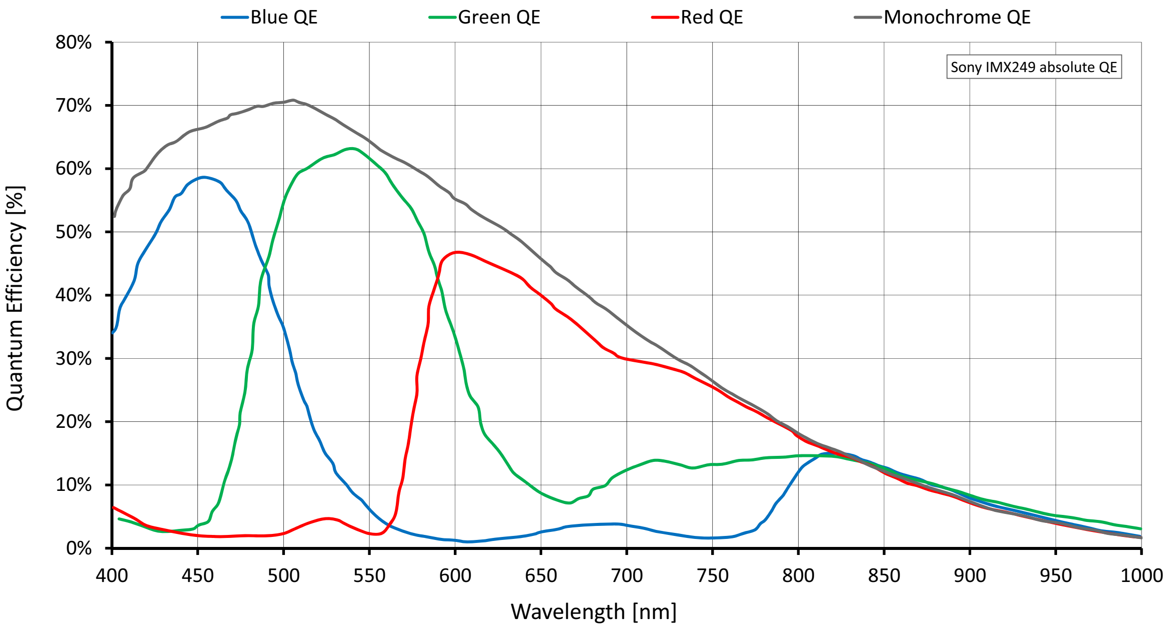



*Figure 24: Alvium 1800 U-234m/c (Sony IMX249) absolute QE*

## Spectral response

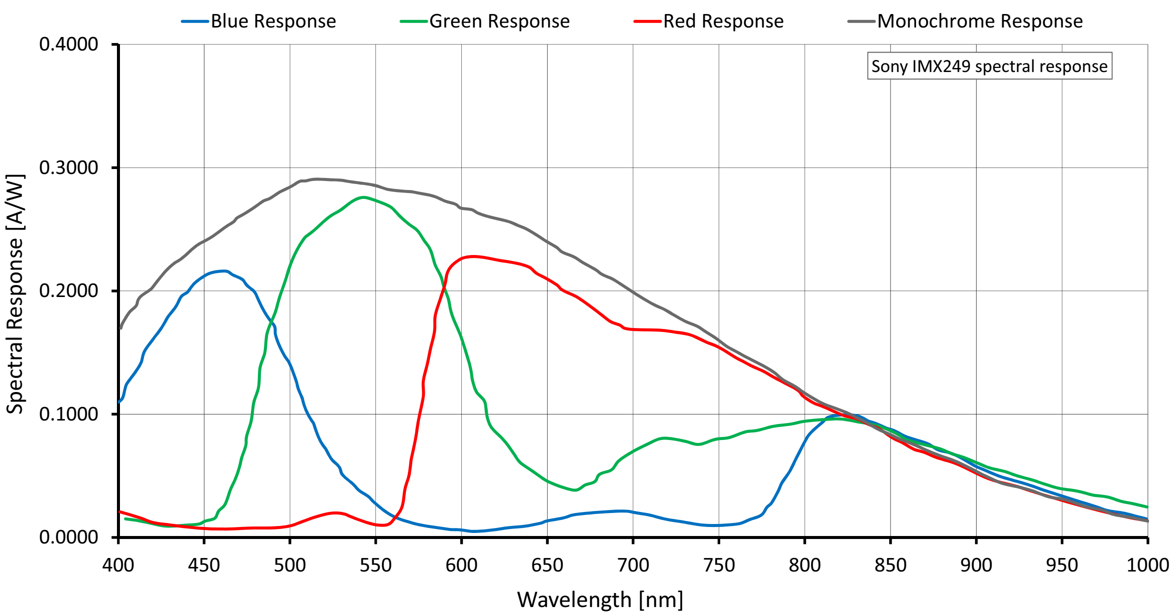



*Figure 25: Alvium 1800 U-234m/c (Sony IMX249) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1936 | 1216 | 2.354 | 40.5/40.5/31.6 | | |
| Full HD | 1920 | 1080 | 2.074 | 45.3/45.3/35.3 | | |
| UXGA | 1600 | 1200 | 1.92 | 41.0/41.0/32.0 | | |
| WXGA+ | 1440 | 900 | 1.296 | 54.0/54.0/42.1 | | |
| SXGA | 1280 | 1024 | 1.311 | 47.8/47.8/37.3 | | |
| HD 720 | 1280 | 720 | 0.922 | 66.6/66.6/51.9 | | |
| XGA | 1024 | 768 | 0.786 | 62.7/62.7/48.9 | | |
| SVGA | 800 | 600 | 0.48 | 79.1/79.1/61.6 | | |
| VGA | 640 | 480 | 0.307 | 97.0/97.0/75.6 | | |
| HVGA | 480 | 320 | 0.154 | 139.3/139.3/108.5 | | |
| QVGA | 320 | 240 | 0.077 | 177.8/177.8/138.6 | | |
| HQVGA | 240 | 160 | 0.038 | 245.9/245.9/192.5 | | |
| QQVGA | 160 | 120 | 0.019 | 305.9/305.9/238.4 | | |
| Max. × half | 1936 | 608 | 1.177 | 77.6/77.6/60.6 | | |
| Max. × min. | 1936 | 8 | 0.015 | 828.8/828.8/656.5 | | |
| Min. × max. | 8 | 1216 | 0.01 | 40.7/40.7/31.7 | | |
| Min. × min. | 8 | 8 | 64 Px | 917.6/917.6/715.1 | | |

[1] Mono8 or Mono10, or Bayer...8[(2)] or Bayer...10 at `SensorBitDepth` = 10-Bit[(3)] /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 41: Alvium 1800 U-234m/c ROI frame rates*

# Alvium 1800 U-235m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-235m** | **1800 U-235c** |
| Sensor model | Sony IMX174 | |
| Resolution | 1936 (H) × 1216 (V); 2.35 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.2; 11.3 mm × 7.1 mm; 13.4 mm diagonal | |
| Pixel size | 5.86 µm × 5.86 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 155 fps (at 450 MByte/s) | |
| Exposure time | 19 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.8 W<br>External power: 3.0 W | |

*Table 42: Alvium 1800 U-235m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-235m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 42: Alvium 1800 U-235m/c specifications (sheet 2 of 2)*

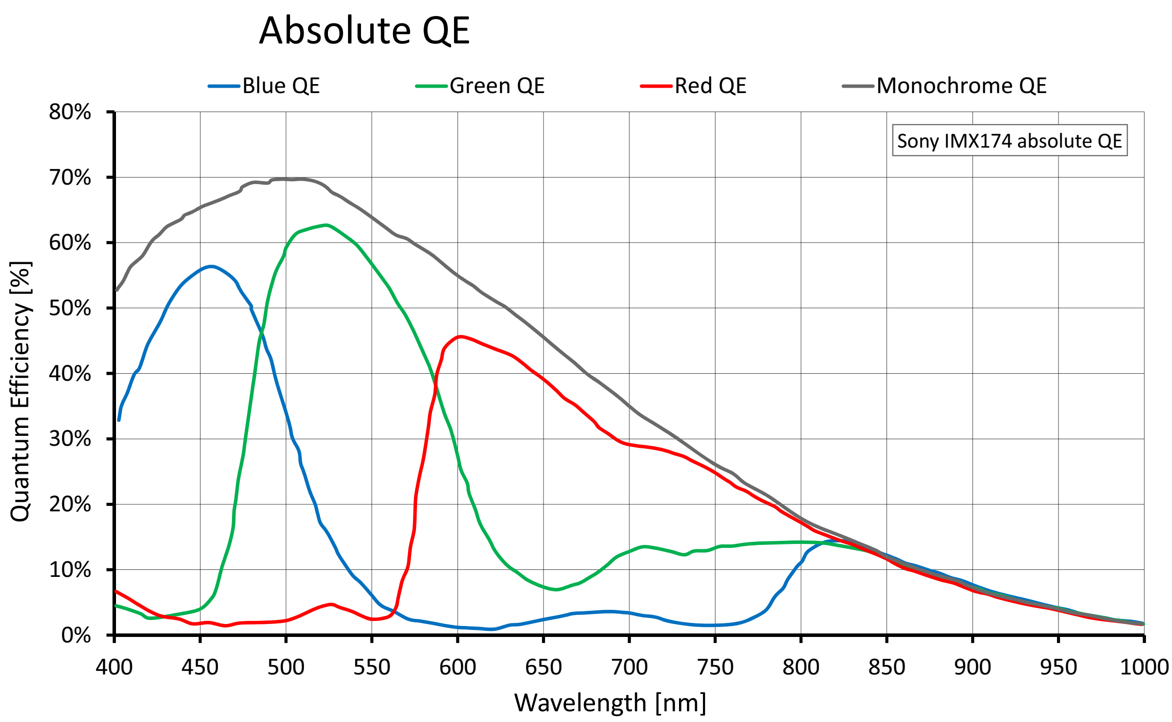



*Figure 26: Alvium 1800 U-235m/c (Sony IMX174) absolute QE*

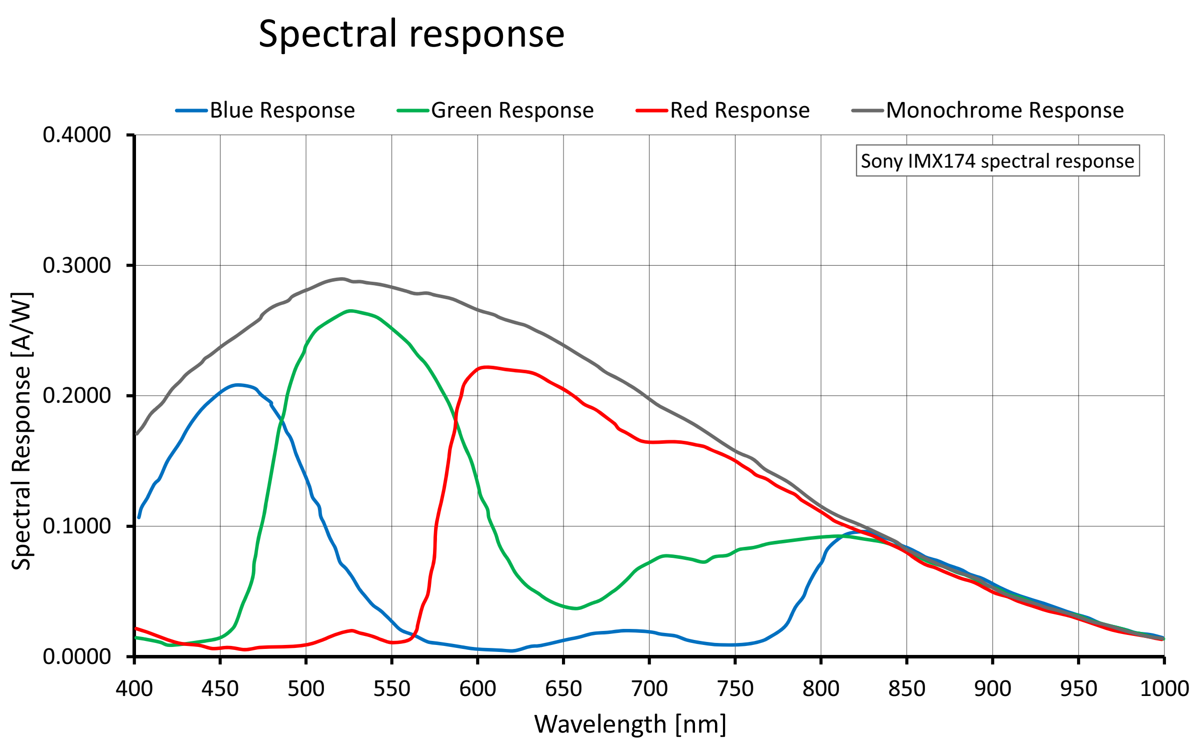



*Figure 27: Alvium 1800 U-235m/c (Sony IMX174) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1936 | 1216 | 2.354 | 155.9/88.8/88.8 | 148.0/75.2/75.1 | 80.3/40.5/40.4 |
| Full HD | 1920 | 1080 | 2.074 | 174.0/100.8/100.0 | 165.4/85.2/84.7 | 90.5/45.8/45.6 |
| UXGA | 1600 | 1200 | 1.92 | 158.7/109.2/109.0 | 158.7/92.3/91.9 | 98.3/49.6/49.6 |
| WXGA+ | 1440 | 900 | 1.296 | 208.0/159.3/158.5 | 208.0/134.7/134.2 | 143.2/72.4/72.0 |
| SXGA | 1280 | 1024 | 1.311 | 185.1/157.7/144.6 | 185.1/133.4/133.0 | 143.0/72.2/71.8 |
| HD 720 | 1280 | 720 | 0.922 | 255.9/218.3/200.1 | 255.9/185.0/184.1 | 198.1/100.5/99.8 |
| XGA | 1024 | 768 | 0.786 | 242.7/242.7/189.8 | 242.7/216.9/189.8 | 233.4/118.3/117.7 |
| SVGA | 800 | 600 | 0.48 | 305.9/305.9/238.9 | | 305.9/189.6/189.4 |
| VGA | 640 | 480 | 0.307 | 375.3/375.3/293.3 | | 375.3/290.5/286.5 |
| HVGA | 480 | 320 | 0.154 | 538.2/538.2/419.7 | | |
| QVGA | 320 | 240 | 0.077 | 689.6/689.6/537.8 | | |
| HQVGA | 240 | 160 | 0.038 | 955.0/955.0/744.8 | | |
| QQVGA | 160 | 120 | 0.019 | 1182.7/1182.7/927.8 | | |
| Max. × half | 1936 | 608 | 1.177 | 291.9/168.2/167.8 | 277.5/142.9/142.4 | 152.6/77.4/77.2 |
| Max. × min. | 1936 | 8 | 0.015 | 2097.1/1445.9/ 1380.5 | 2030.0/1285.7/ 1223.8 | 1356.9/781.2/ 758.3 |
| Min. × max. | 8 | 1216 | 0.01 | 160.7/160.7/125.3 | | |
| Min. × min. | 8 | 8 | 64 Px | 3507.3/3507.3/ 2735.4 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit[(3)] /
Mono10 or Bayer...10[(2)] at `SensorBitDepth` = 10-Bit[(3)] /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 43: Alvium 1800 U-235m/c ROI frame rates*

# Alvium 1800 U-240m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-240m (monochrome) | 1800 U-240c (color) |
| Sensor model | Sony IMX392 | |
| Resolution | 1936 (H) × 1216 (V); 2.4 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/2.3; 6.7 mm × 4.2 mm; 7.9 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 176 fps (at 450 MByte/s) | |
| Exposure time | 23 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | *Free* \| *Tile* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.8 W<br>External power: 3.0 W | |

*Table 44: Alvium 1800 U-240m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-240m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 44: Alvium 1800 U-240m/c specifications (sheet 2 of 2)*

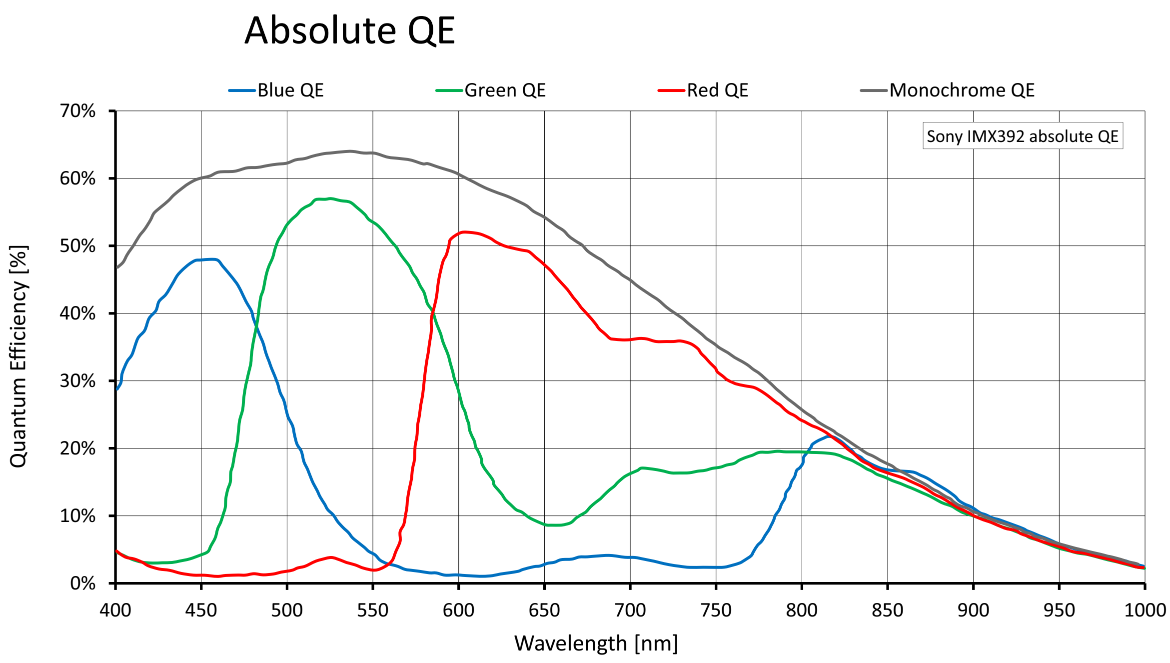



*Figure 28: Alvium 1800 U-240m/c (Sony IMX392) absolute QE*

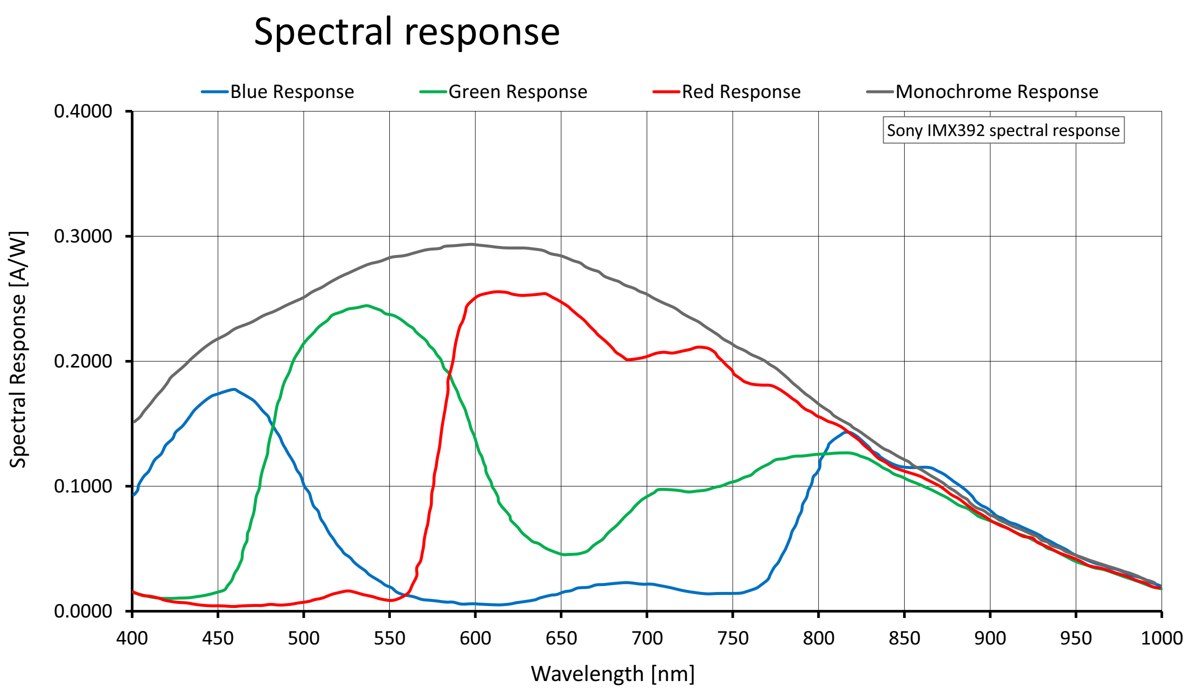



*Figure 29: Alvium 1800 U-240m/c (Sony IMX392) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 1936 | 1216 | 2.354 | 176.0/88.9/89.0 | 149.3/75.3/75.4 | 80.6/40.5/40.5 |
| Full HD | 1920 | 1080 | 2.074 | 199.0/101.0/100.4 | 166.8/85.3/85.0 | 90.6/45.9/45.8 |
| UXGA | 1600 | 1200 | 1.92 | 195.5/109.4/109.3 | 181.3/92.4/92.1 | 98.6/49.7/49.8 |
| WXGA+ | 1440 | 900 | 1.296 | 256.0/159.6/159.1 | 256.0/135.0/134.7 | 143.7/72.6/72.3 |
| SXGA | 1280 | 1024 | 1.311 | 227.8/158.0/152.7 | 227.8/133.7/133.4 | 143.4/72.4/72.1 |
| HD 720 | 1280 | 720 | 0.922 | 314.7/218.9/211.4 | 314.7/185.5/185.0 | 199.0/100.7/100.3 |
| XGA | 1024 | 768 | 0.786 | 299.0/246.4/200.8 | 299.0/217.4/200.8 | 234.6/118.6/118.3 |
| SVGA | 800 | 600 | 0.48 | 376.1/310.6/253.0 | | 371.1/190.2/190.5 |
| VGA | 640 | 480 | 0.307 | 461.1/381.2/310.8 | | 461.1/291.6/288.6 |
| HVGA | 480 | 320 | 0.154 | 658.4/547.1/447.1 | | |
| QVGA | 320 | 240 | 0.077 | 833.4/701.5/574.7 | | |
| HQVGA | 240 | 160 | 0.038 | 1135.0/968.3/796.3 | | |
| QQVGA | 160 | 120 | 0.019 | 1385.9/1192.2/983.7 | | |
| Max. × half | 1936 | 608 | 1.177 | 330.2/168.7/168.8 | 281.5/143.3/143.2 | 153.5/77.7/77.7 |
| Max. × min. | 1936 | 8 | 0.015 | 2438.0/1483.5/ 1450.4 | 2222.5/1320.9/ 1289.1 | 1432.3/805.7/ 805.7 |
| Min. × max. | 8 | 1216 | 0.01 | 196.4/162.5/132.1 | | |
| Min. × min. | 8 | 8 | 64 Px | 3635.5/3381.1/2883.3 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 8-Bit[3] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 45: Alvium 1800 U-240m/c ROI frame rates*

# Alvium 1800 U-291m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-291m (monochrome)** | **1800 U-291c (color)** |
| Sensor model | Sony IMX421 | |
| Resolution | 1944 (H) x 1472 (V); 2.9 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 8.8 mm × 6.6 mm; 10.8 mm diagonal | |
| Pixel size | 4.5 µm × 4.5 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 144 fps (at 450 MByte/s) | |
| Exposure time | 14 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (***Sum***, ***Average***) | Not applicable |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 4.0 W<br>External power: 4.2 W | |

*Table 46: Alvium 1800 U-291m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-291m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 46: Alvium 1800 U-291m/c specifications (sheet 2 of 2)*

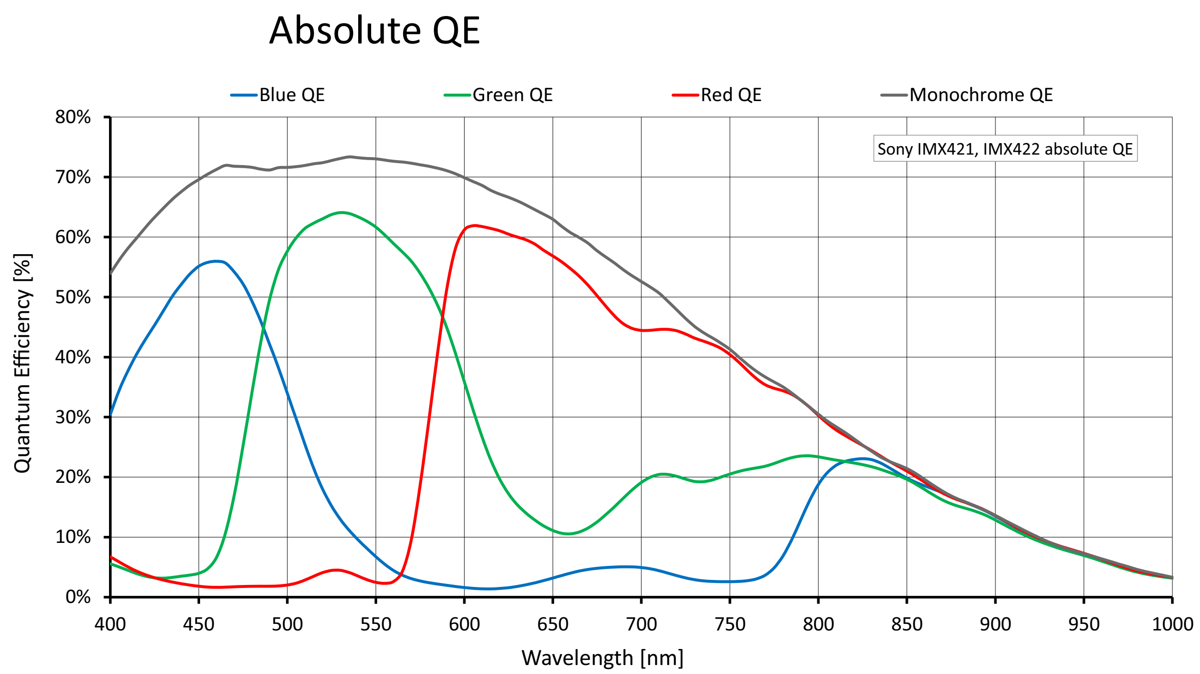



*Figure 30: Alvium 1800 U-291m/c (Sony IMX421) absolute QE*

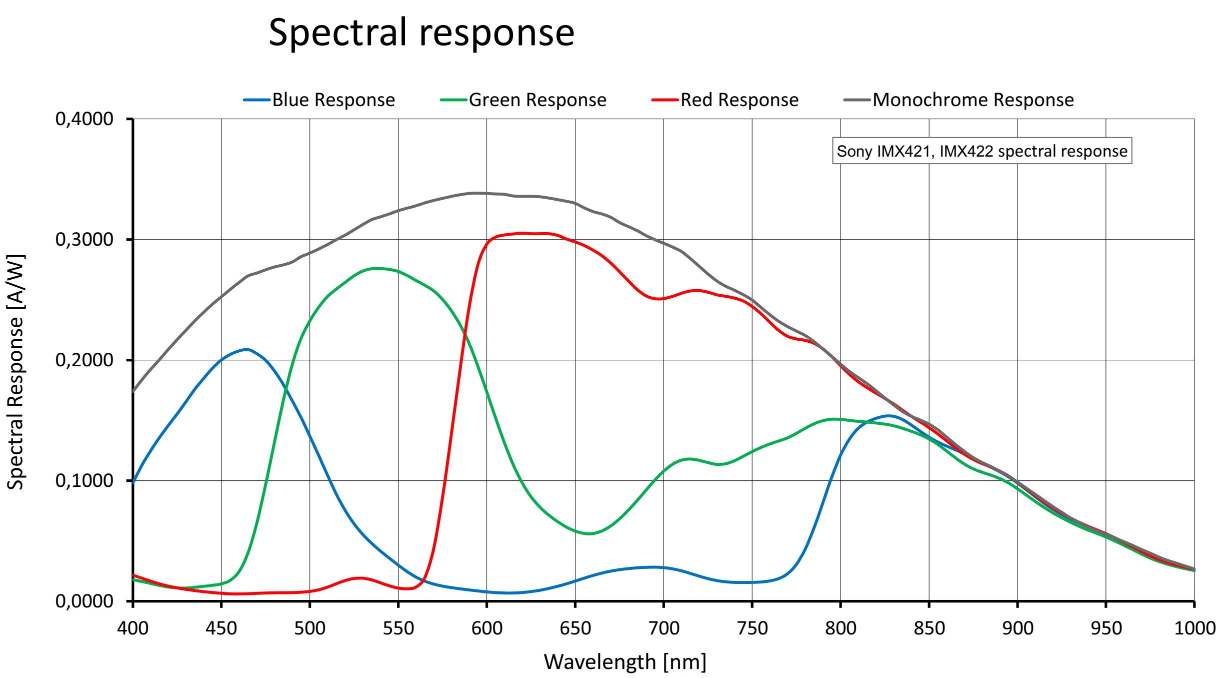



*Figure 31: Alvium 1800 U-291m/c (Sony IMX421) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

<table>
<tr><th rowspan="2">Image format</th><th rowspan="2">Width [pixels]</th><th rowspan="2">Height [pixels]</th><th rowspan="2">ROI area [MP]</th><th colspan="3">Frame rate [fps][1]</th></tr>
<tr><th>450 MByte/s</th><th>375 MByte/s</th><th>200 MByte/s</th></tr>
<tr><td>Full resolution</td><td>1944</td><td>1472</td><td>2.862</td><td>144.3/72.8/73.0</td><td>121.0/61.6/61.3</td><td>65.5/33.0/33.0</td></tr>
<tr><td>Full HD</td><td>1920</td><td>1080</td><td>2.074</td><td>194.0/98.6/98.2</td><td>162.6/83.3/83.1</td><td>88.3/44.8/44.7</td></tr>
<tr><td>UXGA</td><td>1600</td><td>1200</td><td>1.92</td><td>201.7/107.0/107.1</td><td>177.1/90.4/90.3</td><td>96.3/48.6/48.8</td></tr>
<tr><td>WXGA+</td><td>1440</td><td>900</td><td>1.296</td><td>261.0/154.5/154.4</td><td>254.0/130.7/130.7</td><td>138.8/70.2/70.1</td></tr>
<tr><td>SXGA</td><td>1280</td><td>1024</td><td>1.311</td><td>234.3/154.0/153.2</td><td>234.3/130.3/130.3</td><td>139.5/70.5/70.4</td></tr>
<tr><td>HD 720</td><td>1280</td><td>720</td><td>0.922</td><td>320.3/211.3/210.1</td><td>320.3/179.1/179.1</td><td>191.6/97.2/97.0</td></tr>
<tr><td>XGA</td><td>1024</td><td>768</td><td>0.786</td><td>304.4/248.5/214.3</td><td>304.4/210.3/211.4</td><td>226.4/114.7/114.6</td></tr>
<tr><td>SVGA</td><td>800</td><td>600</td><td>0.48</td><td colspan="2">379.9/315.1/268.1</td><td>355.1/182.4/183.3</td></tr>
<tr><td>VGA</td><td>640</td><td>480</td><td>0.307</td><td colspan="2">462.0/383.1/326.9</td><td>462.0/277.2/275.2</td></tr>
<tr><td>HVGA</td><td>480</td><td>320</td><td>0.154</td><td colspan="2">645.2/537.9/460.6</td><td>645.2/509.3/460.6</td></tr>
<tr><td>QVGA</td><td>320</td><td>240</td><td>0.077</td><td colspan="3">810.9/676.1/580.8</td></tr>
<tr><td>HQVGA</td><td>240</td><td>160</td><td>0.038</td><td colspan="3">1077.9/906.1/782.6</td></tr>
<tr><td>QQVGA</td><td>160</td><td>120</td><td>0.019</td><td colspan="3">1299.9/1097.4/952.1</td></tr>
<tr><td>Max. × half</td><td>1944</td><td>736</td><td>1.431</td><td>269.0/137.1/137.4</td><td>226.5/116.3/115.7</td><td>123.6/62.7/62.8</td></tr>
<tr><td>Max. × min.</td><td>1944</td><td>8</td><td>0.016</td><td>1848.1/1087.9/ 1081.0</td><td>1635.6/954.7/949.8</td><td>1005.4/558.5/570.5</td></tr>
<tr><td>Min. × max.</td><td>8</td><td>1472</td><td>0.012</td><td colspan="3">170.7/141.1/119.7</td></tr>
<tr><td>Min. × min.</td><td>8</td><td>8</td><td>64 Px</td><td>2979.5/2599.7/ 2338.0</td><td colspan="2">2979.5/2599.8/2338.0</td></tr>
</table>

[1] Mono8 or Bayer...8[(2)] at **SensorBitDepth** = 8-Bit[(3)] /
Mono10 or Bayer...10 at **SensorBitDepth** = 10-Bit /
Mono12 or Bayer...12 at **SensorBitDepth** = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 47: Alvium 1800 U-291m/c ROI frame rates*

# Alvium 1800 U-319m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-319m (monochrome) | 1800 U-319c (color) |
| Sensor model | Sony IMX265 | |
| Resolution | 2064 (H) × 1544 (V); 3.2 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.8; 7.1 mm × 5.3 mm; 8.9 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 54 fps (at ≥200 MByte/s) | |
| Exposure time | 26 µs to 10 s (200 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power:2.2 W<br>External power: 2.4 W | |

*Table 48: Alvium 1800 U-319m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-319m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
</table>

[1] See Mounting the heat sink on page 272.

[2] Output by `DeviceTemperature`

[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 48: Alvium 1800 U-319m/c specifications (sheet 2 of 2)*

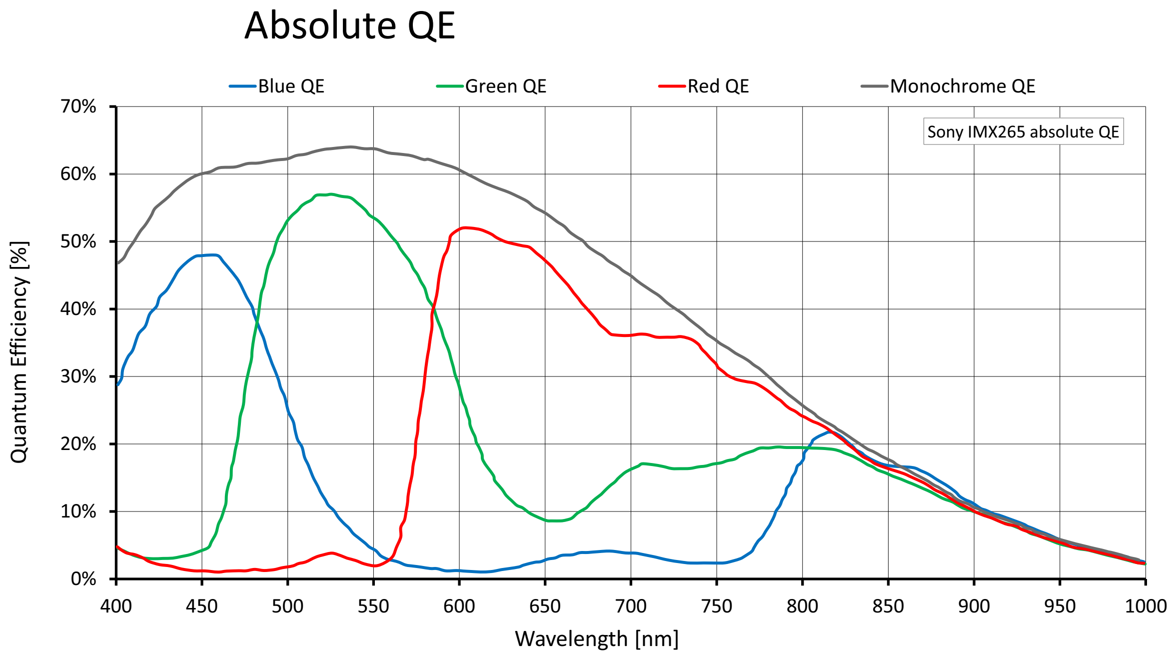



*Figure 32: Alvium 1800 U-319m/c (Sony IMX265) absolute QE*

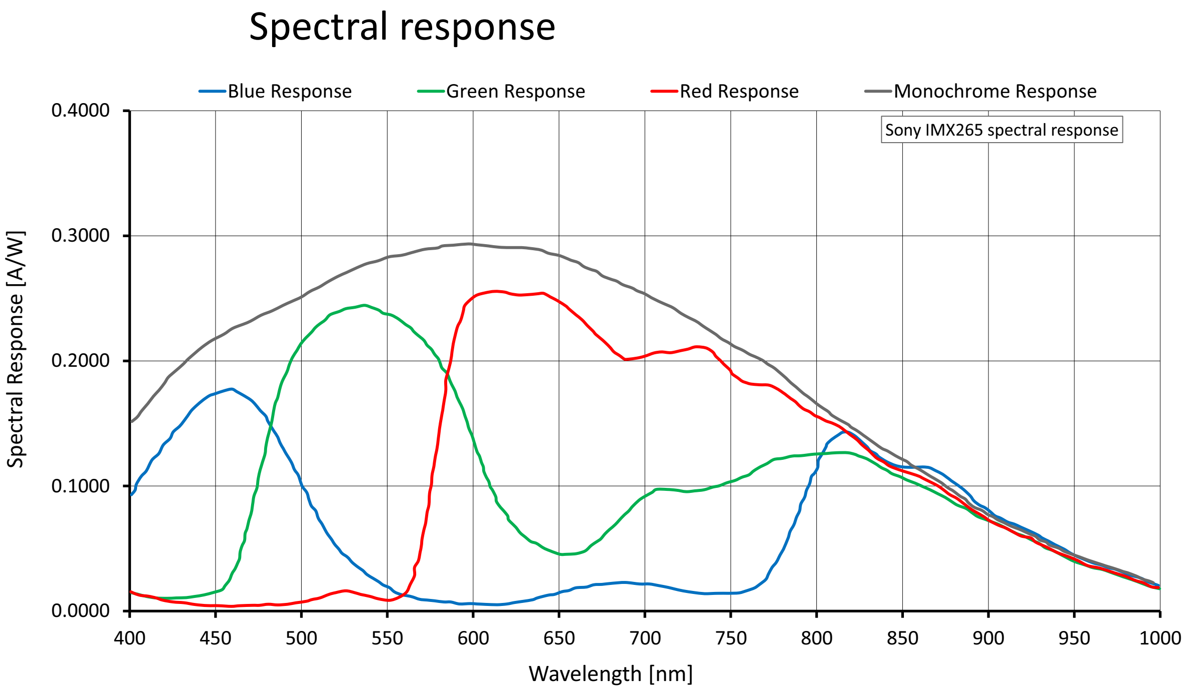



*Figure 33: Alvium 1800 U-319m/c (Sony IMX265) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2064 | 1544 | 3.187 | 54.2/54.2 | | |
| QXGA | 2048 | 1536 | 3.146 | 54.4/54.4 | | |
| Full HD | 1920 | 1080 | 2.074 | 76.2/76.2 | | |
| UXGA | 1600 | 1200 | 1.92 | 69.1/69.1 | | |
| WXGA+ | 1440 | 900 | 1.296 | 90.9/90.9 | | |
| SXGA | 1280 | 1024 | 1.311 | 80.5/80.5 | | |
| HD 720 | 1280 | 720 | 0.922 | 112.0/112.0 | | |
| XGA | 1024 | 768 | 0.786 | 105.9/105.9 | | |
| SVGA | 800 | 600 | 0.48 | 133.5/133.5 | | |
| VGA | 640 | 480 | 0.307 | 163.8/163.8 | | |
| HVGA | 480 | 320 | 0.154 | 235.5/235.5 | | |
| QVGA | 320 | 240 | 0.077 | 301.5/301.5 | | |
| HQVGA | 240 | 160 | 0.038 | 419.0/419.0 | | |
| QQVGA | 160 | 120 | 0.019 | 518.7/518.7 | | |
| Max. × half | 2064 | 772 | 1.593 | 104.1/104.1 | | |
| Max. × min. | 2064 | 8 | 0.017 | 1193.8/1193.8 | | |
| Min. × max. | 8 | 1544 | 0.012 | 54.7/54.7 | | |
| Min. × min. | 8 | 8 | 64 Px | 1556.2/1556.2 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit / Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 49: Alvium 1800 U-319m/c ROI frame rates*

# Alvium 1800 U-320 VSWIR

**Heat affecting your application**

Image noise is increased by high operating temperatures, especially with Alvium VSWIR models. Therefore, we recommend you to optimize your SWIR application for heat dissipation. For more information on heat dissipation, see the Heat Dissipation for Housed Alvium CSI-2, USB, and G1 Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

| Feature | Specification |
|---|---|
| | **1800 U-320 VSWIR** |
| 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) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p |
| Maximum frame rate | 123 fps (at 450 MByte/s) |
| Exposure time | 34 µs to 10 s (450 MByte/s) |
| Exposure modes | Timed, TriggerControlled, TriggerWidth |
| Gain | 0 dB to 42 dB; 0.1 dB increments |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 |
| Image buffer (RAM) | 256 KByte |
| Non-volatile memory (Flash) | 1024 KByte |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA |
| Power requirements | Power over USB; External power |
| Power consumption (typical, at 5 VDC) | USB power: 2.8 W<br>External power: 2.8 W |

*Table 50: Alvium 1800 U-320 VSWIR specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-320 VSWIR</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
</table>

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 50: Alvium 1800 U-320 VSWIR specifications (sheet 2 of 2)*

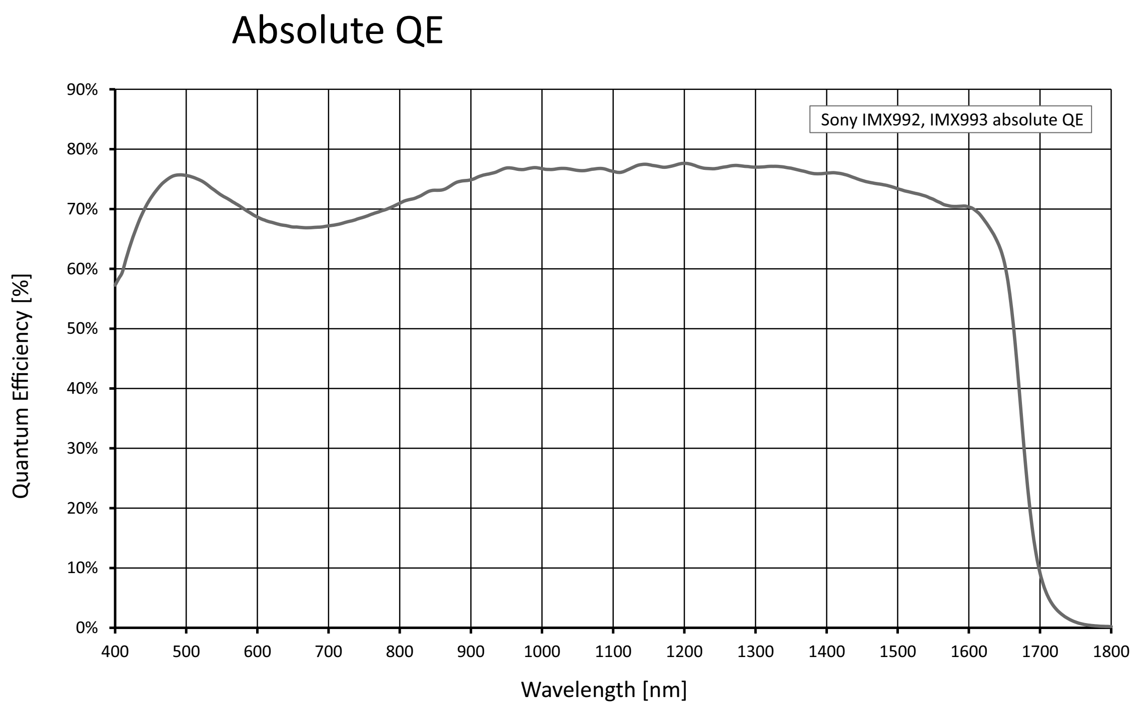



*Figure 34: Alvium 1800 U-320 VSWIR (Sony IMX993) absolute QE*
*According to manufacturer data*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2080 | 1544 | 3,212 | 123.9/62.6/62.3 | 105.1/52.8/52.5 | 56.6/28.4/28.3 |
| QXGA | 2048 | 1536 | 3,146 | 125.9/63.8/63.7 | 106.6/53.7/53.6 | 57.7/29.0/28.9 |
| Full HD | 1920 | 1080 | 2,074 | 180.1/93.3/92.7 | 154.6/78.9/78.4 | 83.9/42.4/42.2 |
| UXGA | 1600 | 1200 | 1,92 | 165.1/101.8/101.6 | 165.1/86.0/85.7 | 91.9/46.2/46.2 |
| WXGA+ | 1440 | 900 | 1,296 | 211.2/145.0/140.9 | 211.2/122.5/122.1 | 130.7/65.8/65.5 |
| SXGA | 1280 | 1024 | 1,311 | 190.4/145.5/127.0 | 190.4/123.1/122.7 | 132.2/66.6/66.2 |
| HD 720 | 1280 | 720 | 0,922 | 255.8/195.6/170.7 | 255.8/165.6/164.9 | 178.1/89.8/89.3 |
| XGA | 1024 | 768 | 0,786 | 243.9/200.0/162.8 | 243.9/195.4/162.8 | 211.2/106.4/105.9 |
| SVGA | 800 | 600 | 0,48 | 299.4/245.5/199.9 | | 299.4/166.4/166.2 |
| VGA | 640 | 480 | 0,307 | 357.6/293.7/238.8 | | 357.6/248.1/238.8 |
| HVGA | 480 | 320 | 0,154 | 481.6/395.8/321.8 | | |
| QVGA | 320 | 240 | 0,077 | 584.9/480.9/391.0 | | |
| HQVGA | 240 | 160 | 0,038 | 739.8/608.6/494.8 | | |
| QQVGA | 160 | 120 | 0,019 | 857.5/705.8/573.8 | | |
| Max. × half | 2080 | 772 | 1,606 | 223.6/113.8/113.1 | 190.3/96.3/95.5 | 103.2/51.9/51.7 |
| Max. × min. | 2080 | 8 | 0,017 | 1147.1/624.8/609.6 | 1006.8/538.9/524.4 | 586.5/304.2/299.8 |
| Min. × max. | 8 | 1544 | 0,012 | 134.3/110.2/89.6 | | |
| Min. × min. | 8 | 8 | 0 | 1509.1/1245.8/1019.7 | | |

[1] Mono8 at `SensorBitDepth` = 8-Bit[2] / Mono10 at `SensorBitDepth` = 10-Bit / Mono12 or at `SensorBitDepth` = 12-Bit

[2] The `SensorBitDepth` value must be set separately from `PixelFormat`. See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 51: Alvium 1800 U-320 VSWIR ROI frame rates*

# Alvium 1800 U-500m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-500m (monochrome) | 1800 U-500c (color) |
| Sensor model | ON Semiconductor AR0521SR | |
| Resolution | 2592 (H) × 1944 (V); 5.0 MP | |
| Sensor type | CMOS | |
| Shutter type | Rolling shutter (RS) | |
| Sensor size | Type 1/2.5; 5.7 mm × 4.3 mm; 7.1 mm diagonal | |
| Pixel size | 2.2 µm × 2.2 µm | |
| CRA | 9 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerGR8, BayerGR10, BayerGR10p, BayerGR12, BayerGR12p |
| Maximum frame rate | 68 fps[1] (at ≥375 MByte/s) | |
| Exposure time | 8 µs to 0.48 s (375 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 24.1 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical at 5 VDC) | USB power: 2.2 W<br>External power: 2.4 W | |
| [1] In triggered mode: ~34 fps | | |

*Table 52: Alvium 1800 U-500m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-500m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[2]</td><td>Mainboard[3]</td></tr>
<tr><td>Bare board[4]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[5]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[2] See Mounting the heat sink on page 272.<br>[3] Output by <code>DeviceTemperature</code><br>[4] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[5] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 52: Alvium 1800 U-500m/c specifications (sheet 2 of 2)*

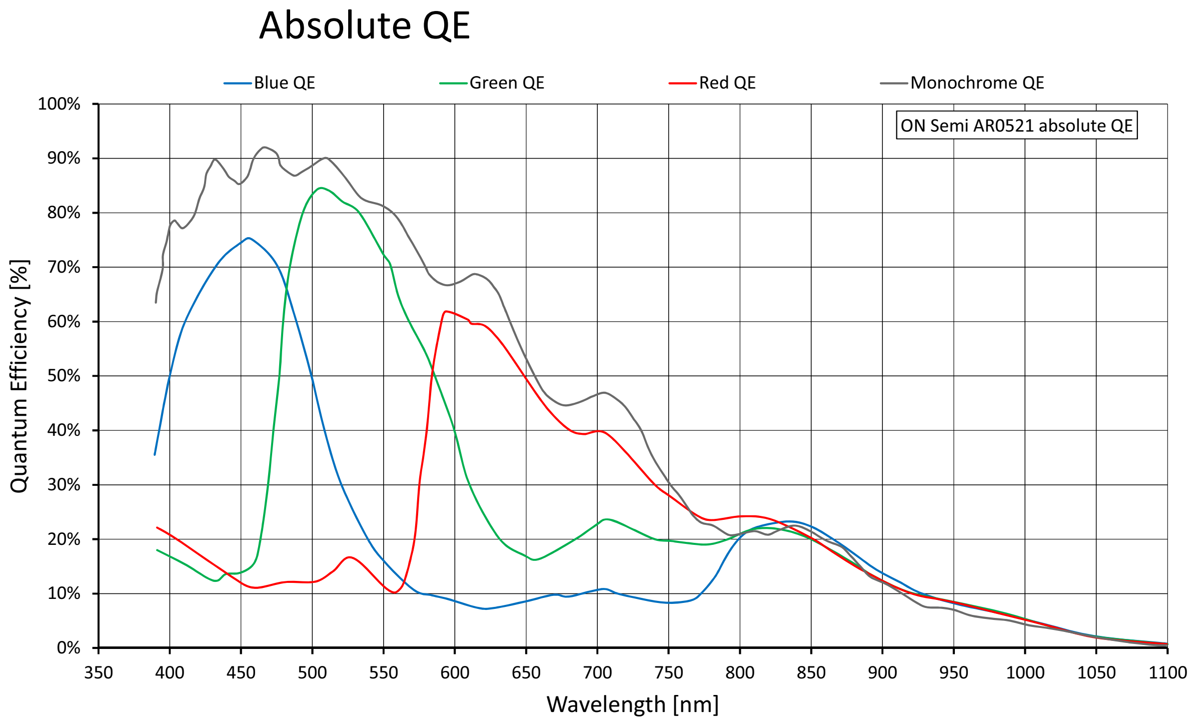



*Figure 35: Alvium 1800 U-500m/c (ON Semi AR0521SR) absolute QE*

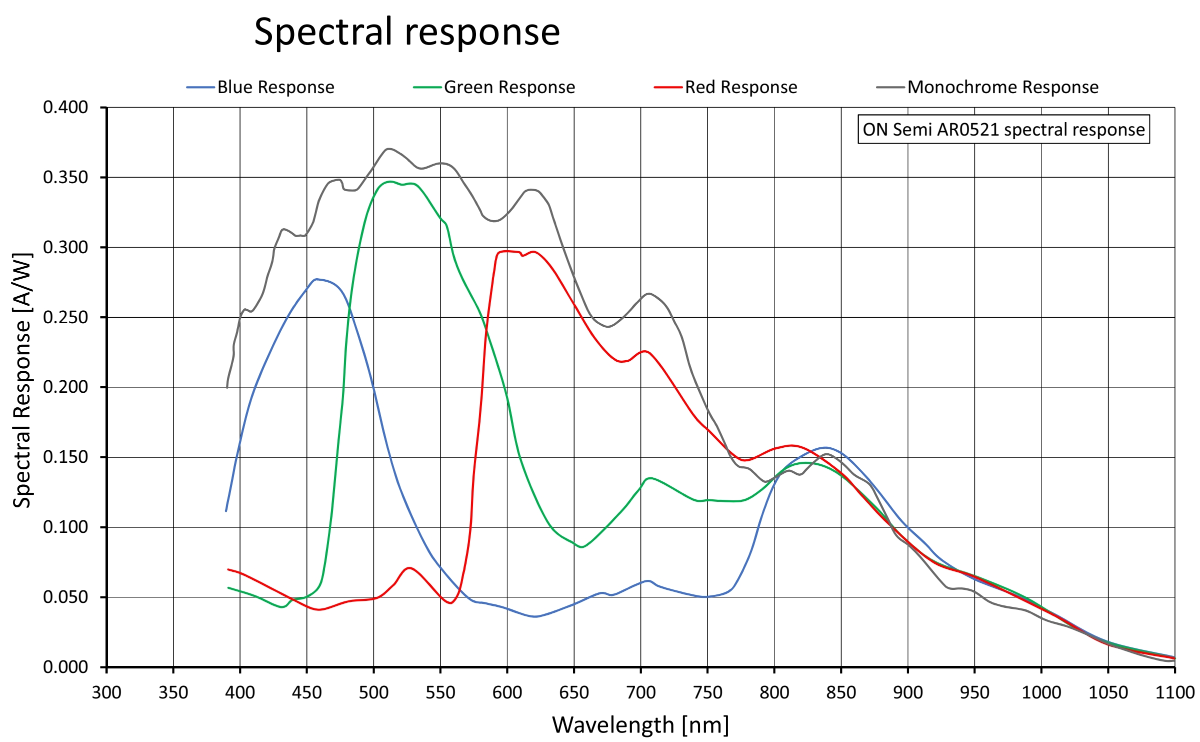



*Figure 36: Alvium 1800 U-500m/c (ON Semi AR0521SR) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 375 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Shutter mode | User mode | Available frame rates |
|---|---|---|
| Rolling shutter (RS) | Freerun | Values in Table 54 below are reached. |
| Rolling shutter (RS) | Triggered | >50% of the values for in Table 54 below are reached. |

*Table 53: Frame rate behavior for different configurations*

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2592 | 1944 | 5.039 | 68.2/43.2 | 68.2/36.4 | 38.8/19.5 |
| WQHD | 2560 | 1440 | 3.686 | 91.1/58.5 | 91.1/49.4 | 52.6/26.4 |
| QXGA | 2048 | 1536 | 3.146 | 85.9/68.7 | 85.9/57.9 | 61.8/31.0 |
| Full HD | 1920 | 1080 | 2.074 | 120.6/102.9 | 120.6/86.9 | 92.6/46.5 |
| UXGA | 1600 | 1200 | 1.92 | 109.2/109.2 | 109.2/94.1 | 100.3/50.4 |
| WXGA+ | 1440 | 900 | 1.296 | 143.9/143.9 | 143.9/137.9 | 143.9/73.9 |
| SXGA | 1280 | 1024 | 1.311 | 127.4/127.4 | | 127.4/73.5 |
| HD 720 | 1280 | 720 | 0.922 | 178.0/178.0 | | 178.0/102.8 |
| XGA | 1024 | 768 | 0.786 | 167.9/167.9 | | 167.9/120.8 |
| SVGA | 800 | 600 | 0.48 | 212.4/212.4 | | 212.4/195.2 |
| VGA | 640 | 480 | 0.307 | 261.9/261.9 | | |
| HVGA | 480 | 320 | 0.154 | 379.3/379.3 | | |
| QVGA | 320 | 240 | 0.077 | 489.7/489.7 | | |
| HQVGA | 240 | 160 | 0.038 | 687.5/687.5 | | |
| QQVGA | 160 | 120 | 0.019 | 861.5/861.5 | | |
| Max. × half | 2592 | 972 | 2.519 | 132.7/84.4 | 132.7/71.2 | 75.8/38.1 |
| Max. × min. | 2592 | 8 | 0.021 | 2194.0/1561.7 | 2194.0/1364.6 | 1428.2/787.8 |
| Min. × max. | 8 | 1944 | 0.016 | 68.7/68.7 | | |
| Min. × min. | 8 | 8 | 64 Px | 2956.0/2956.0 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 54: Alvium 1800 U-500m/c ROI frame rates*

# Alvium 1800 U-501m/c NIR

| Feature | Specification | |
|---|---|---|
| | 1800 U-501m NIR (monochrome) | 1800 U-501c NIR (color) |
| Sensor model | ON Semiconductor AR0522 | |
| Resolution | 2592 (H) × 1944 (V); 5.0 MP | |
| Sensor type | CMOS | |
| Shutter type | Rolling shutter (RS) | |
| Sensor size | Type 1/2.5; 5.7 mm × 4.3 mm; 7.1 mm diagonal | |
| Pixel size | 2.2 µm × 2.2 µm | |
| CRA | 9 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerGR8, BayerGR10, BayerGR10p, BayerGR12, BayerGR12p |
| Maximum frame rate | 68 fps[1] (at ≥375 MByte/s) | |
| Exposure time | 8 µs to 0.48 s (375 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 24.1 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (`Sum`) | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical at 5 VDC) | USB power: 2.2 W<br>External power: 2.4 W | |
| [1] In triggered mode: ~34 fps | | |

*Table 55: Alvium 1800 U-501m/c NIR specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-501m/c NIR (monochrome)</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[2]</td><td>Mainboard[3]</td></tr>
<tr><td>Bare board[4]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[5]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[2] See Mounting the heat sink on page 272.<br>[3] Output by <code>DeviceTemperature</code><br>[4] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[5] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 55: Alvium 1800 U-501m/c NIR specifications (sheet 2 of 2)*

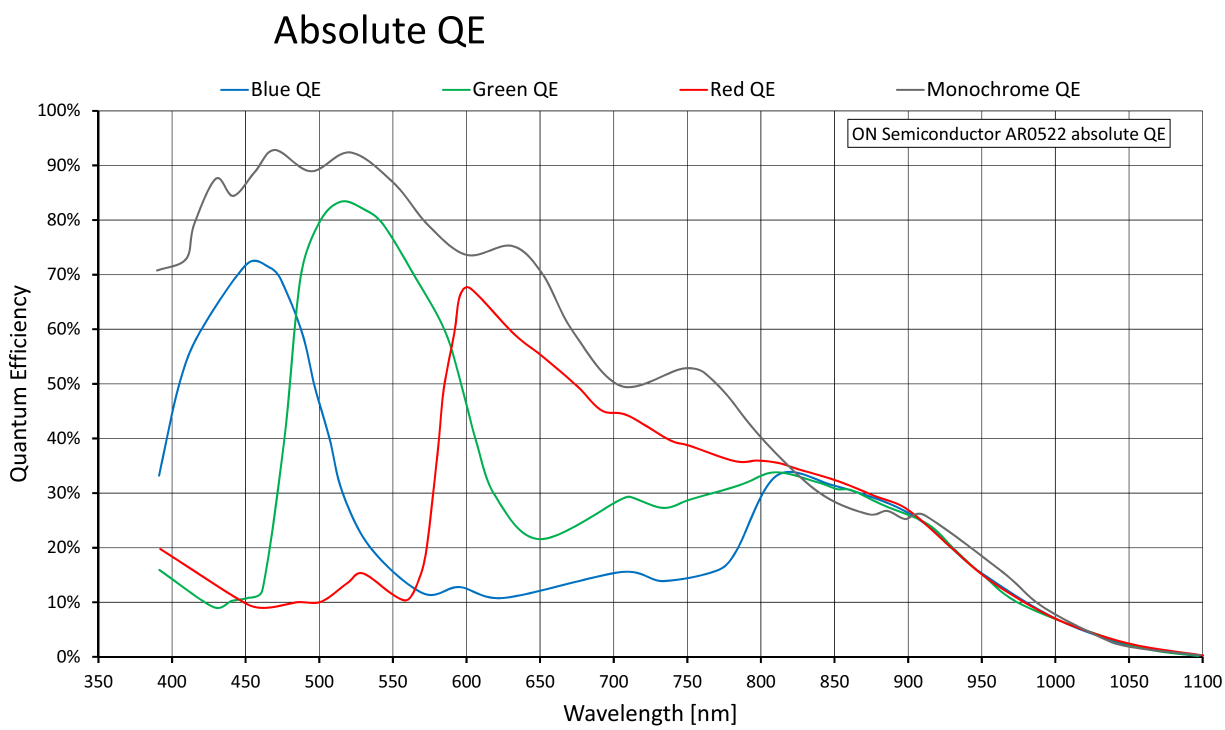



*Figure 37: Alvium 1800 U-501m/c NIR (ON Semi AR0522) absolute QE*

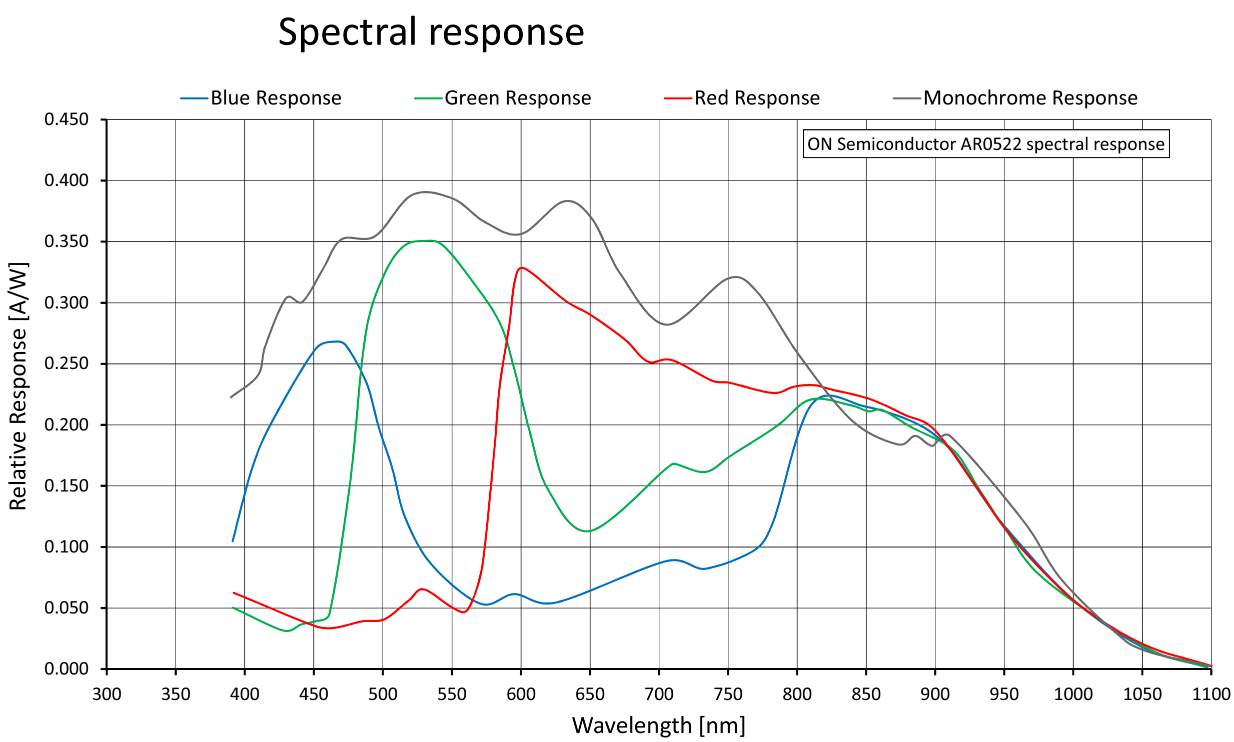



*Figure 38: Alvium 1800 U-501m/c NIR (ON Semi AR0522) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 375 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Shutter mode | User mode | Available frame rates |
|---|---|---|
| Rolling shutter (RS) | Freerun | Values in Table 57 below are reached. |
| Rolling shutter (RS) | Triggered | >50% of the values for in Table 57 below are reached. |

*Table 56: Frame rate behavior for different configurations*

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2592 | 1944 | 5.039 | 68.2/43.2 | 68.2/36.4 | 38.8/19.5 |
| WQHD | 2560 | 1440 | 3.686 | 91.1/58.5 | 91.1/49.4 | 52.6/26.4 |
| QXGA | 2048 | 1536 | 3.146 | 85.9/68.7 | 85.9/57.9 | 61.8/31.0 |
| Full HD | 1920 | 1080 | 2.074 | 120.6/102.9 | 120.6/86.9 | 92.6/46.5 |
| UXGA | 1600 | 1200 | 1.92 | 109.2/109.2 | 109.2/94.1 | 100.3/50.4 |
| WXGA+ | 1440 | 900 | 1.296 | 143.9/143.9 | 143.9/137.9 | 143.9/73.9 |
| SXGA | 1280 | 1024 | 1.311 | 127.4/127.4 | | 127.4/73.5 |
| HD 720 | 1280 | 720 | 0.922 | 178.0/178.0 | | 178.0/102.8 |
| XGA | 1024 | 768 | 0.786 | 167.9/167.9 | | 167.9/120.8 |
| SVGA | 800 | 600 | 0.48 | 212.4/212.4 | | 212.4/195.2 |
| VGA | 640 | 480 | 0.307 | 261.9/261.9 | | |
| HVGA | 480 | 320 | 0.154 | 379.3/379.3 | | |
| QVGA | 320 | 240 | 0.077 | 489.7/489.7 | | |
| HQVGA | 240 | 160 | 0.038 | 687.5/687.5 | | |
| QQVGA | 160 | 120 | 0.019 | 861.5/861.5 | | |
| Max. × half | 2592 | 972 | 2.519 | 132.7/84.4 | 132.7/71.2 | 75.8/38.1 |
| Max. × min. | 2592 | 8 | 0.021 | 2194.0/1561.7 | 2194.0/1364.6 | 1428.2/787.8 |
| Min. × max. | 8 | 1944 | 0.016 | 68.7/68.7 | | |
| Min. × min. | 8 | 8 | 64 Px | 2956.0/2956.0 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 57: Alvium 1800 U-501m/c NIR ROI frame rates*

# Alvium 1800 U-507m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-507m (monochrome)** | **1800 U-507c (color)** |
| Sensor model | Sony IMX264 | |
| Resolution | 2464 (H) × 2056 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 8.5 mm × 7.1 mm; 11.1 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 34 fps (at ≥200 MByte/s) | |
| Exposure time | 28 µs to 10 s (200 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.0 W<br>External power: 2.2 W | |

*Table 58: Alvium 1800 U-507m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-507m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 58: Alvium 1800 U-507m/c specifications (sheet 2 of 2)*

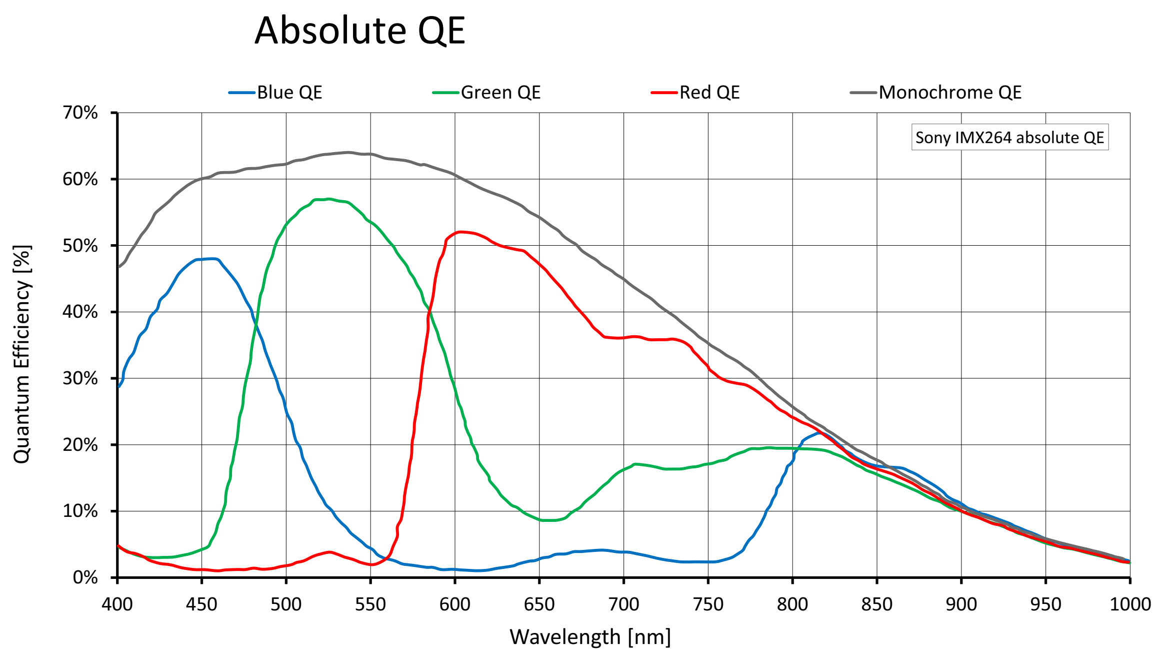



*Figure 39: Alvium 1800 U-507m/c (Sony IMX264) absolute QE*

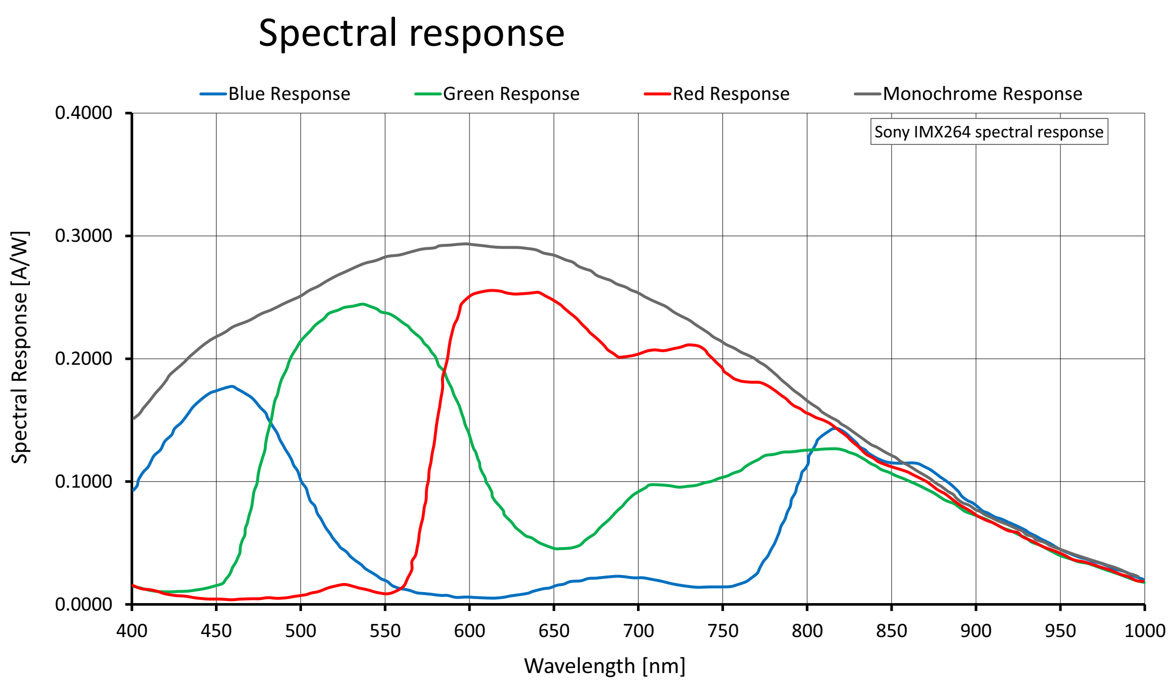



*Figure 40: Alvium 1800 U-507m/c (Sony IMX264) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2464 | 2056 | 5.066 | 34.9/34.9 | | 34.9/19.2 |
| QXGA | 2048 | 1536 | 3.146 | 46.4/46.4 | | 46.4/30.6 |
| Full HD | 1920 | 1080 | 2.074 | 64.9/64.9 | | 64.9/45.8 |
| UXGA | 1600 | 1200 | 1.92 | 58.9/58.9 | | 58.9/49.8 |
| WXGA+ | 1440 | 900 | 1.296 | 77.4/77.4 | | 77.4/72.3 |
| SXGA | 1280 | 1024 | 1.311 | 68.6/68.6 | | 68.6/68.6 |
| HD 720 | 1280 | 720 | 0.922 | 95.5/95.5 | | |
| XGA | 1024 | 768 | 0.786 | 90.1/90.1 | | |
| SVGA | 800 | 600 | 0.48 | 113.7/113.7 | | |
| VGA | 640 | 480 | 0.307 | 139.5/139.5 | | |
| HVGA | 480 | 320 | 0.154 | 200.3/200.3 | | |
| QVGA | 320 | 240 | 0.077 | 257.3/257.3 | | |
| HQVGA | 240 | 160 | 0.038 | 356.3/356.3 | | |
| QQVGA | 160 | 120 | 0.019 | 441.1/441.1 | | |
| Max. × half | 2464 | 1028 | 2.533 | 67.8/67.8 | | 67.8/37.4 |
| Max. × min. | 2464 | 8 | 0.02 | 1015.1/1015.1 | 1015.1/1015.1 | 1015.1/634.0 |
| Min. × max. | 8 | 2056 | 0.016 | 35.2/35.2 | | |
| Min. × min. | 8 | 8 | 64 Px | 1323.2/1323.2 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit[(3)] /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 59: Alvium 1800 U-507m/c ROI frame rates*

# Alvium 1800 U-507m/c Pol

**Please observe**

For first series models, pixel processing has not been adjusted to enable the complete functionality available with non-polarizer models:

- Only raw pixel formats are supported, but no formats for polarizer sensors.
- Features based on pixel processing are available but cannot be used to generate a proper output. For example, color processing, binning, convolution filter, DPC, or FPNC are not supported.

| Feature | Specification | |
|---|---|---|
| | **1800 U-507m Pol (monochrome)** | **1800 U-507c Pol (color)** |
| Sensor model | Sony IMX264MZR | Sony IMX264MYR |
| Resolution | 2464 (H) × 2056 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 8.5 mm × 7.1 mm; 11.1 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Not applicable |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 34 fps (at ≥200 MByte/s) | |
| Exposure time | 28 µs to 10 s (200 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.0 W<br>External power: 2.2 W | |

*Table 60: Alvium 1800 U-507m/c Pol specifications (sheet 1 of 2)*

| **Feature** | **Specification** | | | |
|---|---|---|---|---|
| | **1800 U-507m/c** | | | |
| Storage temperature | -20 °C to +85 °C ambient temperature | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 60: Alvium 1800 U-507m/c Pol specifications (sheet 2 of 2)*

## Absolute QE, spectral response

We intend to add diagrams in a future version of this document.

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2464 | 2056 | 5.066 | 34.9/34.9 | | 34.9/19.2 |
| QXGA | 2048 | 1536 | 3.146 | 46.4/46.4 | | 46.4/30.6 |
| Full HD | 1920 | 1080 | 2.074 | 64.9/64.9 | | 64.9/45.8 |
| UXGA | 1600 | 1200 | 1.92 | 58.9/58.9 | | 58.9/49.8 |
| WXGA+ | 1440 | 900 | 1.296 | 77.4/77.4 | | 77.4/72.3 |
| SXGA | 1280 | 1024 | 1.311 | 68.6/68.6 | | 68.6/68.6 |
| HD 720 | 1280 | 720 | 0.922 | 95.5/95.5 | | |
| XGA | 1024 | 768 | 0.786 | 90.1/90.1 | | |
| SVGA | 800 | 600 | 0.48 | 113.7/113.7 | | |
| VGA | 640 | 480 | 0.307 | 139.5/139.5 | | |
| HVGA | 480 | 320 | 0.154 | 200.3/200.3 | | |
| QVGA | 320 | 240 | 0.077 | 257.3/257.3 | | |
| HQVGA | 240 | 160 | 0.038 | 356.3/356.3 | | |
| QQVGA | 160 | 120 | 0.019 | 441.1/441.1 | | |
| Max. × half | 2464 | 1028 | 2.533 | 67.8/67.8 | | 67.8/37.4 |
| Max. × min. | 2464 | 8 | 0.02 | 1015.1/1015.1 | 1015.1/1015.1 | 1015.1/634.0 |
| Min. × max. | 8 | 2056 | 0.016 | 35.2/35.2 | | |
| Min. × min. | 8 | 8 | 64 Px | 1323.2/1323.2 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 12-Bit[3] /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 61: Alvium 1800 U-507m/c Pol ROI frame rates*

## Alvium 1800 U-508m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-508m (monochrome)** | **1800 U-508c (color)** |
| Sensor model | Sony IMX250 | |
| Resolution | 2464 (H) x 2056 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 8.5 mm × 7.1 mm; 11.1 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 84 fps (at 450 MByte/s) | |
| Exposure time | 20 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 1 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.9 W<br>External power: 3.1 W | |

*Table 62: Alvium 1800 U-508m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-508m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
</table>

[1] See Mounting the heat sink on page 272.

[2] Output by `DeviceTemperature`

[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 62: Alvium 1800 U-508m/c specifications (sheet 2 of 2)*

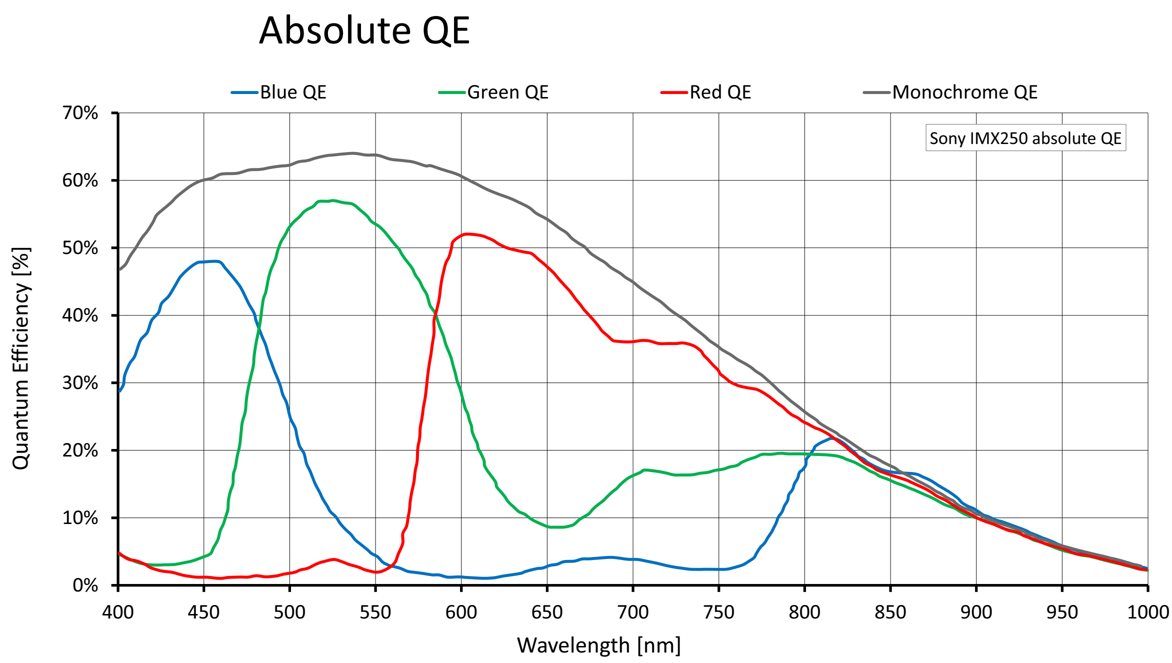



*Figure 41: Alvium 1800 U-508m/c (Sony IMX250) absolute QE*

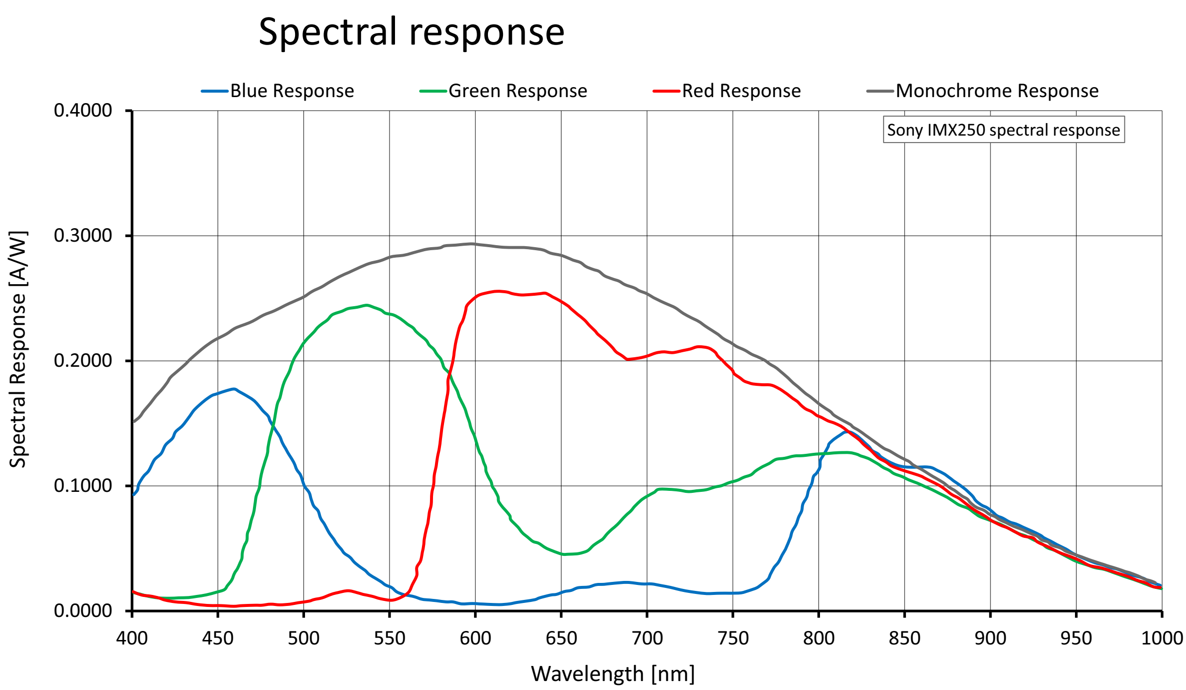



*Figure 42: Alvium 1800 U-508m/c (Sony IMX250) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | **450 MByte/s** | **375 MByte/s** | **200 MByte/s** |
| Full resolution | 2464 | 2056 | 5.066 | 84.2/42.3/42.4 | 71.3/35.7/35.7 | 38.2/19.2/19.2 |
| QXGA | 2048 | 1536 | 3.146 | 126.0/67.4/67.3 | 112.7/56.8/56.6 | 61.1/30.6/30.5 |
| Full HD | 1920 | 1080 | 2.074 | 175.8/100.8/100.0 | 166.8/85.2/84.7 | 90.6/45.8/45.6 |
| UXGA | 1600 | 1200 | 1.92 | 160.0/109.2/109.0 | 160.0/92.3/91.9 | 98.6/49.6/49.6 |
| WXGA+ | 1440 | 900 | 1.296 | 209.9/159.3/146.2 | 209.9/134.7/134.2 | 143.7/72.4/72.0 |
| SXGA | 1280 | 1024 | 1.311 | 186.5/152.5/129.9 | 186.5/133.4/129.9 | 143.4/72.2/71.8 |
| HD 720 | 1280 | 720 | 0.922 | 258.2/211.2/179.8 | 258.2/185.0/179.8 | 199.0/100.5/99.8 |
| XGA | 1024 | 768 | 0.786 | 244.9/200.1/170.6 | | 234.6/118.3/117.7 |
| SVGA | 800 | 600 | 0.48 | 308.1/252.0/214.9 | | 308.1/189.6/189.4 |
| VGA | 640 | 480 | 0.307 | 378.4/309.6/263.9 | | 378.4/290.5/263.9 |
| HVGA | 480 | 320 | 0.154 | 541.1/443.8/377.3 | | |
| QVGA | 320 | 240 | 0.077 | 686.8/567.5/483.8 | | |
| HQVGA | 240 | 160 | 0.038 | 940.0/783.3/667.8 | | |
| QQVGA | 160 | 120 | 0.019 | 1152.4/964.5/822.2 | | |
| Max. × half | 2464 | 1028 | 2.533 | 161.9/81.9/81.9 | 137.4/69.2/69.1 | 74.2/37.4/37.3 |
| Max. × min. | 2464 | 8 | 0.02 | 1937.8/1139.2/ 1088.3 | 1748.8/1010.2/961.0 | 1125.8/614.7/596.7 |
| Min. × max. | 8 | 2056 | 0.016 | 96.5/79.1/67.4 | | |
| Min. × min. | 8 | 8 | 64 Px | 3138.1/2735.3/2331.8 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 8-Bit[3] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 63: Alvium 1800 U-508m/c ROI frame rates*

# Alvium 1800 U-508m/c Pol

**Please observe**

For first series models, pixel processing has not been adjusted to enable the complete functionality available with non-polarizer models:

- Only raw pixel formats are supported, but no formats for polarizer sensors.
- Features based on pixel processing are available but cannot be used to generate a proper output. For example, color processing, binning, convolution filter, DPC, or FPNC are not supported.

| Feature | Specification | |
|---|---|---|
| | **1800 U-508m Pol (monochrome)** | **1800 U-508c Pol (color)** |
| Sensor model | Sony IMX250MZR | Sony IMX250MYR |
| Resolution | 2464 (H) x 2056 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 8.5 mm × 7.1 mm; 11.1 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Not applicable |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 84 fps (at 450 MByte/s) | |
| Exposure time | 20 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.9 W<br>External power: 3.1 W | |

*Table 64: Alvium 1800 U-508m/c Pol specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-508m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
</table>

[1] See Mounting the heat sink on page 272.

[2] Output by `DeviceTemperature`

[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.

[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 64: Alvium 1800 U-508m/c Pol specifications (sheet 2 of 2)*

## Absolute QE, spectral response

We intend to add diagrams in a future version of this document.

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2464 | 2056 | 5.066 | 84.2/42.3/42.4 | 71.3/35.7/35.7 | 38.2/19.2/19.2 |
| QXGA | 2048 | 1536 | 3.146 | 126.0/67.4/67.3 | 112.7/56.8/56.6 | 61.1/30.6/30.5 |
| Full HD | 1920 | 1080 | 2.074 | 175.8/100.8/100.0 | 166.8/85.2/84.7 | 90.6/45.8/45.6 |
| UXGA | 1600 | 1200 | 1.92 | 160.0/109.2/109.0 | 160.0/92.3/91.9 | 98.6/49.6/49.6 |
| WXGA+ | 1440 | 900 | 1.296 | 209.9/159.3/146.2 | 209.9/134.7/134.2 | 143.7/72.4/72.0 |
| SXGA | 1280 | 1024 | 1.311 | 186.5/152.5/129.9 | 186.5/133.4/129.9 | 143.4/72.2/71.8 |
| HD 720 | 1280 | 720 | 0.922 | 258.2/211.2/179.8 | 258.2/185.0/179.8 | 199.0/100.5/99.8 |
| XGA | 1024 | 768 | 0.786 | 244.9/200.1/170.6 | | 234.6/118.3/117.7 |
| SVGA | 800 | 600 | 0.48 | 308.1/252.0/214.9 | | 308.1/189.6/189.4 |
| VGA | 640 | 480 | 0.307 | 378.4/309.6/263.9 | | 378.4/290.5/263.9 |
| HVGA | 480 | 320 | 0.154 | 541.1/443.8/377.3 | | |
| QVGA | 320 | 240 | 0.077 | 686.8/567.5/483.8 | | |
| HQVGA | 240 | 160 | 0.038 | 940.0/783.3/667.8 | | |
| QQVGA | 160 | 120 | 0.019 | 1152.4/964.5/822.2 | | |
| Max. × half | 2464 | 1028 | 2.533 | 161.9/81.9/81.9 | 137.4/69.2/69.1 | 74.2/37.4/37.3 |
| Max. × min. | 2464 | 8 | 0.02 | 1937.8/1139.2/ 1088.3 | 1748.8/1010.2/961.0 | 1125.8/614.7/596.7 |
| Min. × max. | 8 | 2056 | 0.016 | 96.5/79.1/67.4 | | |
| Min. × min. | 8 | 8 | 64 Px | 3138.1/2735.3/2331.8 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 8-Bit[(3)] /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

[3] The `SensorBitDepth` value must be set separately from `PixelFormat`.
See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 65: Alvium 1800 U-508m/c Pol ROI frame rates*

## Alvium 1800 U-510m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-510m (monochrome)** | **1800 U-510c (color)** |
| Sensor model | Sony IMX548 | |
| Resolution | 2472 (H) × 2064 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.8; 6.8 mm × 5.7 mm; 8.8 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 79 fps (at 450 MByte/s) | |
| Exposure time | 8 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | *Free* \| *Tile* \| *Horizontal*: 1 × 1 to 1 × 4 \| *Vertical*: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.0 W<br>External power: 3.2 W | |

*Table 66: Alvium 1800 U-510m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-510m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 66: Alvium 1800 U-510m/c specifications (sheet 2 of 2)*

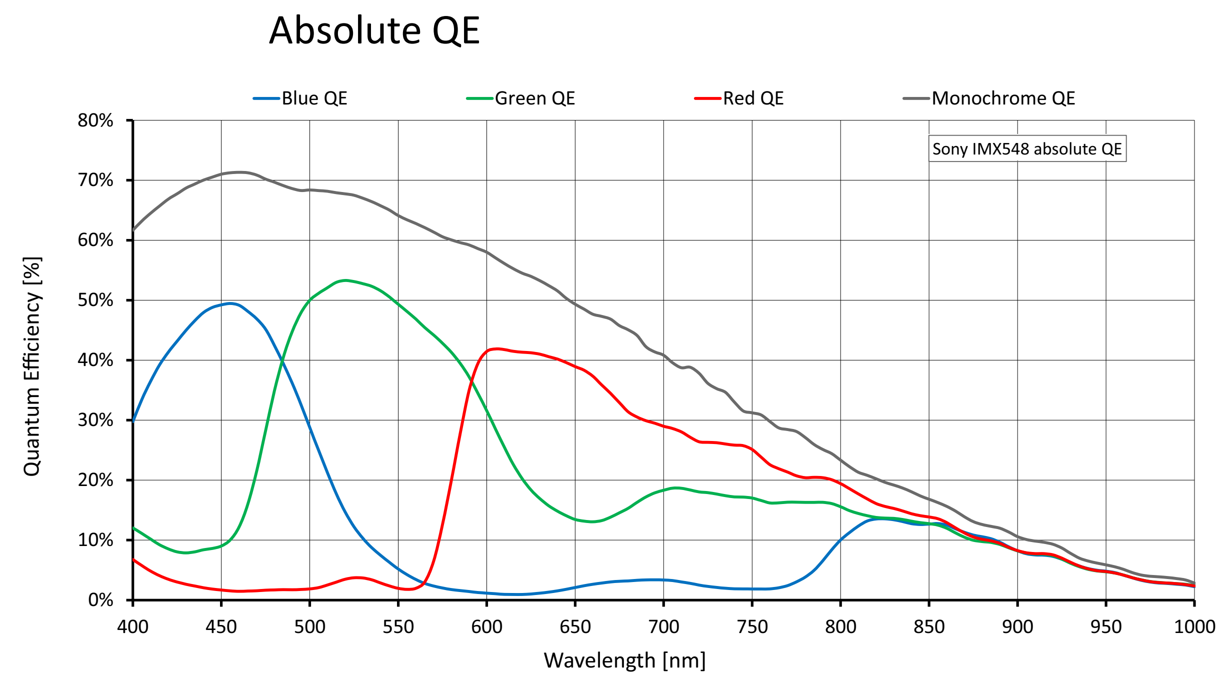



*Figure 43: Alvium 1800 U-510m/c (Sony IMX548) absolute QE*

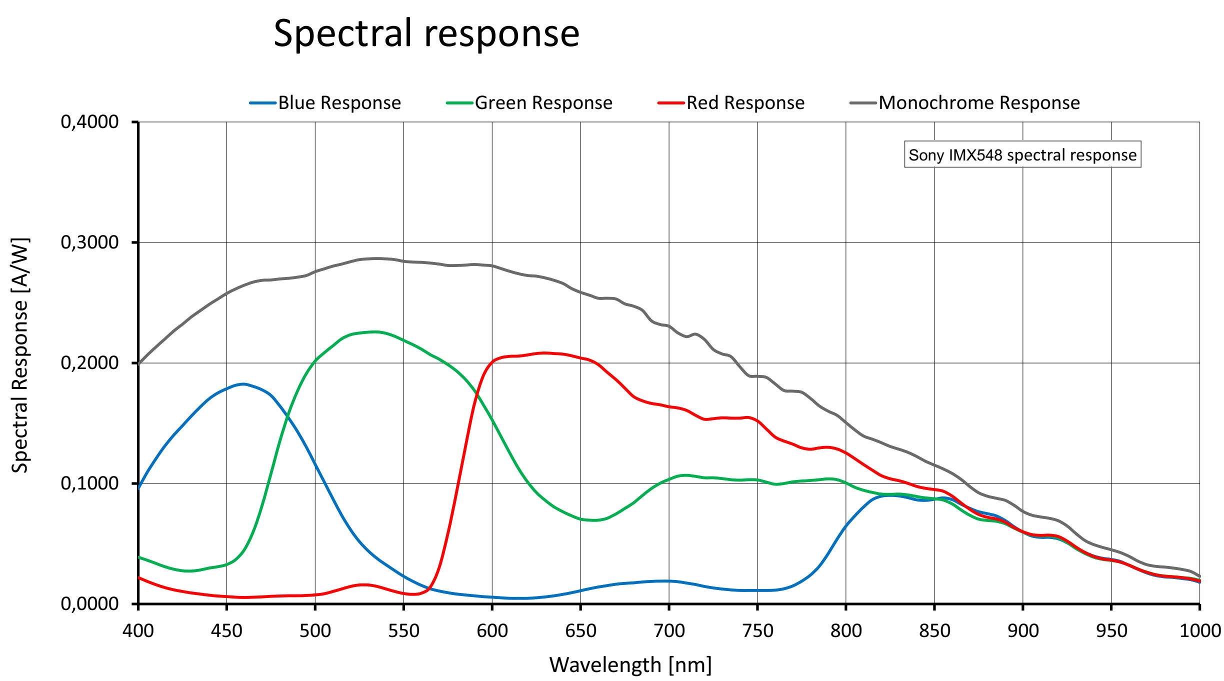



*Figure 44: Alvium 1800 U-510m/c (Sony IMX548) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2472 | 2064 | 5.102 | 79.9/40.3 | 67.1/33.9 | 36.1/18.2 |
| QXGA | 2048 | 1536 | 3.146 | 106.8/63.6 | 105.7/53.6 | 57.0/28.8 |
| Full HD | 1920 | 1080 | 2.074 | 145.5/92.7 | 145.5/78.2 | 83.0/41.9 |
| UXGA | 1600 | 1200 | 1.92 | 133.4/101.0 | 133.4/85.3 | 90.9/45.9 |
| WXGA+ | 1440 | 900 | 1.296 | 170.2/143.8 | 170.2/121.0 | 129.0/65.0 |
| SXGA | 1280 | 1024 | 1.311 | 153.5/145.0 | 153.5/122.5 | 130.6/65.8 |
| HD 720 | 1280 | 720 | 0.922 | 205.8/194.5 | 205.8/164.4 | 175.3/88.4 |
| XGA | 1024 | 768 | 0.786 | 195.9/195.9 | 195.9/194.2 | 195.9/105.1 |
| SVGA | 800 | 600 | 0.48 | 239.9/239.9 | | 239.9/163.5 |
| VGA | 640 | 480 | 0.307 | 285.4/285.4 | | 285.4/243.0 |
| HVGA | 480 | 320 | 0.154 | 380.5/380.5 | | 380.5/340.8 |
| QVGA | 320 | 240 | 0.077 | 456.0/456.0 | | 456.0/408.6 |
| HQVGA | 240 | 160 | 0.038 | 569.0/569.0 | | 569.0/510.2 |
| QQVGA | 160 | 120 | 0.019 | 649.4/649.4 | | 649.4/582.5 |
| Max. × half | 2472 | 1032 | 2.551 | 147.4/74.8 | 124.0/63.1 | 67.1/33.9 |
| Max. × min. | 2472 | 8 | 0.02 | 905.6/500.6 | 781.9/428.0 | 453.4/237.9 |
| Min. × max. | 8 | 2064 | 0.017 | 82.5/82.5 | | 82.5/73.8 |
| Min. × min. | 8 | 8 | 64 Px | 1074.8/1074.8 | | 1074.8/966.3 |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 67: Alvium 1800 U-510m/c ROI frame rates*

# Alvium 1800 U-511m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-511m (monochrome) | 1800 U-511c (color) |
| Sensor model | Sony IMX547 | |
| Resolution | 2472 (H) × 2064 (V); 5.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.8; 6.8 mm × 5.7 mm; 8.8 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 79 fps (at 450 MByte/s) | |
| Exposure time | 8 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | *Free* \| *Tile* \| *Horizontal*: 1 × 1 to 1 × 4 \| *Vertical*: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.2 W<br>External power: 3.4 W | |

*Table 68: Alvium 1800 U-511m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-511m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 68: Alvium 1800 U-511m/c specifications (sheet 2 of 2)*

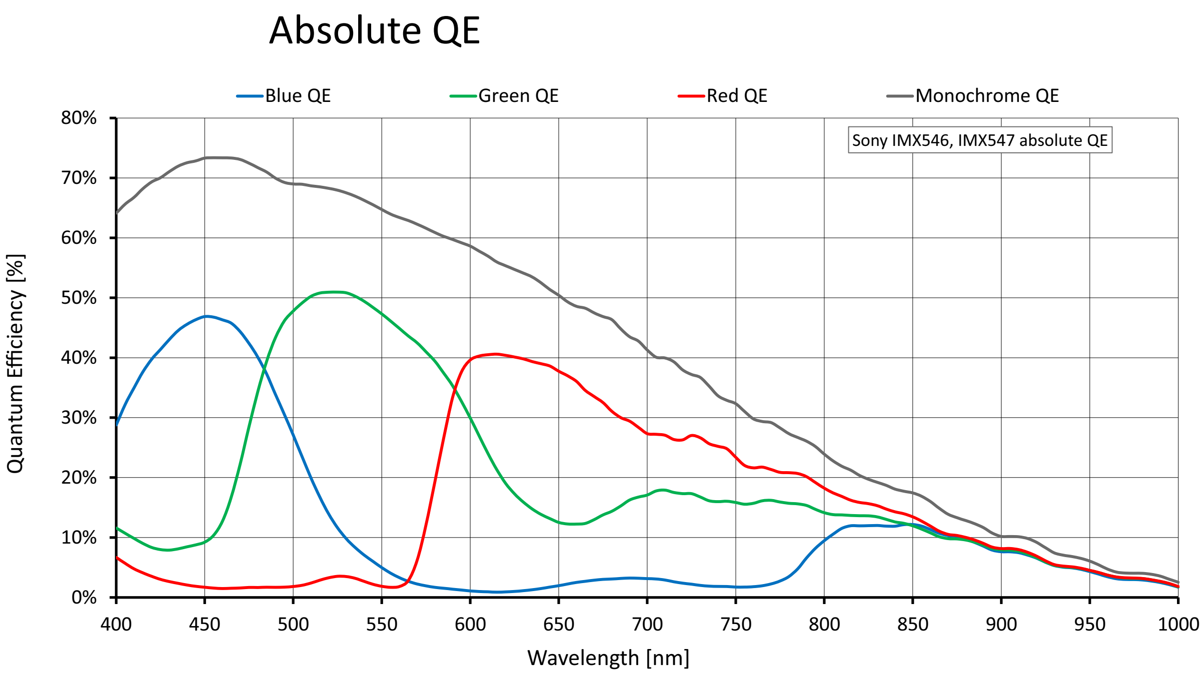



*Figure 45: Alvium 1800 U-511m/c (Sony IMX547) absolute QE*

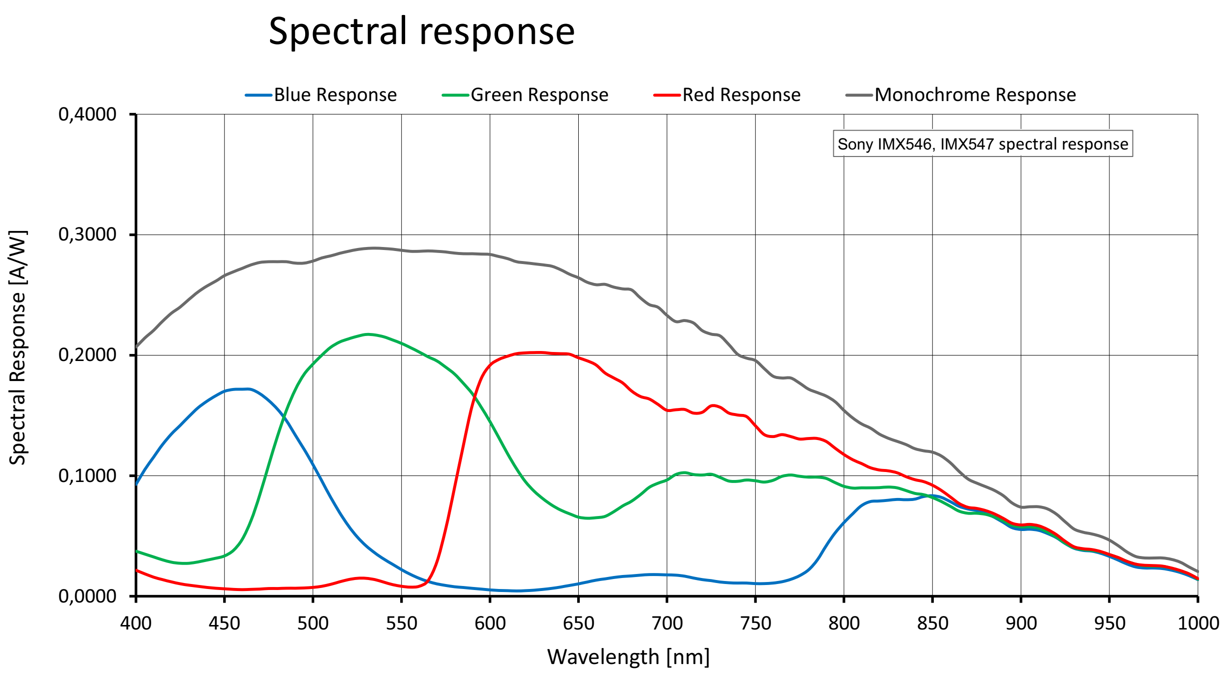



*Figure 46: Alvium 1800 U-511m/c (Sony IMX547) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2472 | 2064 | 5.102 | 79.9/40.3 | 67.1/33.9 | 36.1/18.2 |
| QXGA | 2048 | 1536 | 3.146 | 104.7/63.6 | 104.7/53.6 | 57.0/28.8 |
| Full HD | 1920 | 1080 | 2.074 | 142.7/92.7 | 142.7/78.2 | 83.0/41.9 |
| UXGA | 1600 | 1200 | 1.92 | 130.8/101.0 | 130.8/85.3 | 90.9/45.9 |
| WXGA+ | 1440 | 900 | 1.296 | 167.0/143.8 | 167.0/121.0 | 129.0/65.0 |
| SXGA | 1280 | 1024 | 1.311 | 150.6/145.0 | 150.6/122.5 | 130.6/65.8 |
| HD 720 | 1280 | 720 | 0.922 | 201.8/194.5 | 201.8/164.4 | 175.3/88.4 |
| XGA | 1024 | 768 | 0.786 | 192.3/192.3 | | 192.3/105.0 |
| SVGA | 800 | 600 | 0.48 | 235.3/235.3 | | 235.3/163.5 |
| VGA | 640 | 480 | 0.307 | 279.8/279.8 | | 279.8/243.0 |
| HVGA | 480 | 320 | 0.154 | 373.1/373.1 | | 373.1/340.8 |
| QVGA | 320 | 240 | 0.077 | 447.2/447.2 | | 447.2/408.6 |
| HQVGA | 240 | 160 | 0.038 | 557.9/557.9 | | 557.9/510.1 |
| QQVGA | 160 | 120 | 0.019 | 636.8/636.8 | | 636.8/582.5 |
| Max. × half | 2472 | 1032 | 2.551 | 147.4/74.8 | 124.0/63.1 | 67.1/33.9 |
| Max. × min. | 2472 | 8 | 0.02 | 905.6/500.6 | 781.9/428.0 | 453.4/237.9 |
| Min. × max. | 8 | 2064 | 0.017 | 80.9/80.9 | 80.9/80.9 | 80.9/73.8 |
| Min. × min. | 8 | 8 | 64 Px | 1053.9/1053.9 | 1053.9/1053.9 | 1053.9/966.3 |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 12-Bit / Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 69: Alvium 1800 U-511m/c ROI frame rates*

# Alvium 1800 U-530 VSWIR

**Heat affecting your application**

Image noise is increased by high operating temperatures, especially with Alvium VSWIR models. Therefore, we recommend you to optimize your SWIR application for heat dissipation. For more information on heat dissipation, see the Heat Dissipation for Housed Alvium CSI-2, USB, and G1 Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

| Feature | Specification |
|---|---|
| | **1800 U-530 VSWIR** |
| 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) | 8-bit, 10-bit, 12-bit; Adaptive (10-bit, 12-bit) |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p |
| Maximum frame rate | 77 fps (at 450 MByte/s) |
| Exposure time | 38 µs to 10 s (450 MByte/s) |
| Exposure modes | Timed, TriggerControlled, TriggerWidth |
| Gain | 0 dB to 42 dB; 0.1 dB increments |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows |
| Multiple ROI (H × V) | *Free* \| *Tile* \| *Horizontal*: 1 × 1 to 1 × 4 \| *Vertical*: 1 × 1 to 1 × 4 |
| Image buffer (RAM) | 256 KByte |
| Non-volatile memory (Flash) | 1024 KByte |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA |
| Power requirements | Power over USB; External power |
| Power consumption (typical, at 5 VDC) | USB power: 2.9 W<br>External power: 2.9 W |

*Table 70: Alvium 1800 U-530 VSWIR specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-530 VSWIR</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 70: Alvium 1800 U-530 VSWIR specifications (sheet 2 of 2)*

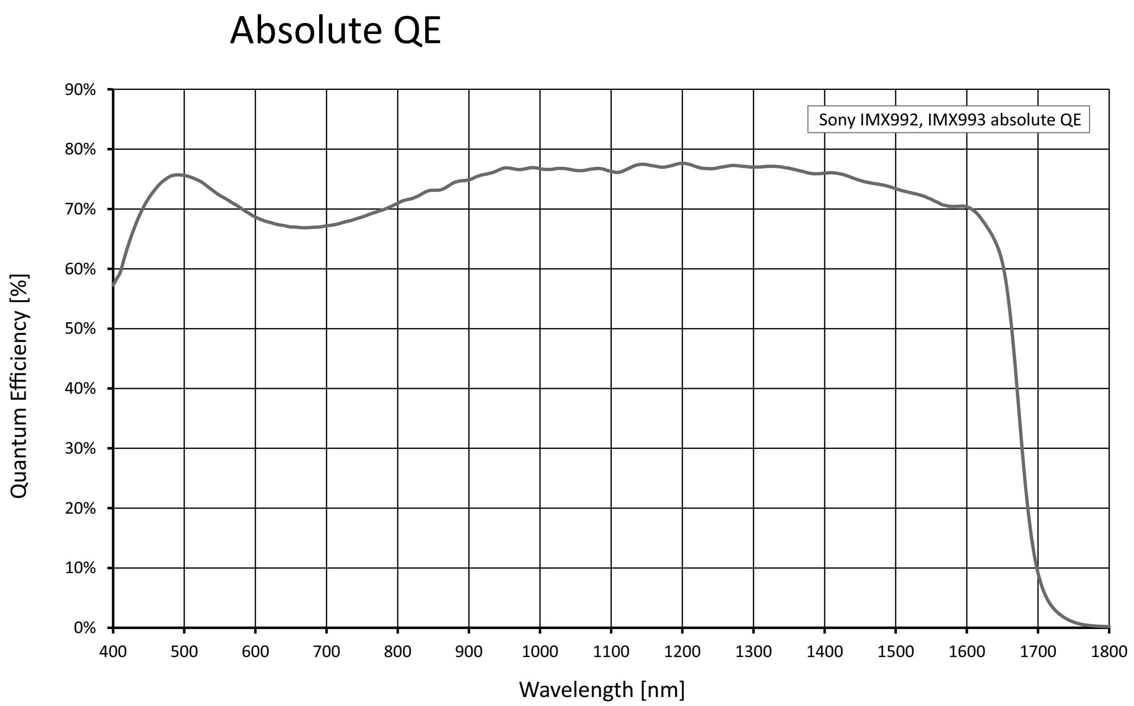



*Figure 47: Alvium 1800 U-530 VSWIR (Sony IMX992) absolute QE*
*According to manufacturer data*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | **450 MByte/s** | **375 MByte/s** | **200 MByte/s** |
| Full resolution | 2592 | 2056 | 5,329 | 77.0/38.7/38.7 | 64.6/32.5/32.6 | 34.8/17.5/17.5 |
| QSXGA | 2560 | 2048 | 5,243 | 78.0/39.3/39.1 | 65.9/33.1/33.1 | 35.4/17.8/17.7 |
| WQHD | 2560 | 1440 | 3,686 | 107.3/54.2/53.9 | 90.7/45.7/45.7 | 48.9/24.6/24.5 |
| QXGA | 2048 | 1536 | 3,146 | 110.9/63.8/63.7 | 106.6/53.7/53.6 | 57.7/29.0/28.9 |
| Full HD | 1920 | 1080 | 2,074 | 151.5/93.3/92.7 | 151.5/78.9/78.4 | 83.9/42.4/42.2 |
| UXGA | 1600 | 1200 | 1,92 | 138.8/101.8/96.4 | 138.8/86.0/85.7 | 91.9/46.2/46.2 |
| WXGA+ | 1440 | 900 | 1,296 | 177.5/145.0/123.3 | 177.5/122.5/122.1 | 130.7/65.8/65.5 |
| SXGA | 1280 | 1024 | 1,311 | 160.0/130.5/111.1 | 160.0/123.1/111.1 | 132.2/66.6/66.2 |
| HD 720 | 1280 | 720 | 0,922 | 215.2/175.6/149.4 | 215.2/165.6/149.4 | 178.1/89.8/89.3 |
| XGA | 1024 | 768 | 0,786 | 205.0/167.4/142.3 | | 205.0/106.4/105.9 |
| SVGA | 800 | 600 | 0,48 | 251.5/205.4/174.8 | | 251.5/166.4/166.2 |
| VGA | 640 | 480 | 0,307 | 300.7/245.5/208.6 | | |
| HVGA | 480 | 320 | 0,154 | 404.7/330.5/281.3 | | |
| QVGA | 320 | 240 | 0,077 | 492.0/401.8/341.9 | | |
| HQVGA | 240 | 160 | 0,038 | 623.1/508.8/433.1 | | |
| QQVGA | 160 | 120 | 0,019 | 720.2/588.2/500.6 | | |
| Max. × half | 2592 | 1028 | 2,665 | 142.2/71.8/71.7 | 119.6/60.5/60.6 | 64.8/32.6/32.6 |
| Max. × min. | 2592 | 8 | 0,021 | 929.0/502.0/491.1 | 803.9/431.7/423.2 | 469.6/244.1/240.9 |
| Min. × max. | 8 | 2056 | 0,016 | 86.3/70.4/59.9 | | |
| Min. × min. | 8 | 8 | 64 Px | 1279.8/1045.2/889.5 | | |

[1] Mono8 at `SensorBitDepth` = 8-Bit[2] / Mono10 at `SensorBitDepth` = 10-Bit / Mono12 or at `SensorBitDepth` = 12-Bit

[2] The `SensorBitDepth` value must be set separately from `PixelFormat`. See Sensor ADC readout modes for maximum frame rates on page 77 for details.

*Table 71: Alvium 1800 U-530 VSWIR ROI frame rates*

# Alvium 1800 U-811m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-811m (monochrome)** | **1800 U-811c (color)** |
| Sensor model | Sony IMX546 | |
| Resolution | 2848 (H) × 2848 (V); 8.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 7.8 mm × 7.8 mm; 11 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 51 fps (at 450 MByte/s) | |
| Exposure time | 9 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (`Sum`) | Not applicable |
| Multiple ROI (H × V) | `Free` \| `Tile` \| `Horizontal`: 1 × 1 to 1 × 4 \| `Vertical`: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.3 W<br>External power: 3.5 W | |

*Table 72: Alvium 1800 U-811m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-811m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 72: Alvium 1800 U-811m/c specifications (sheet 2 of 2)*

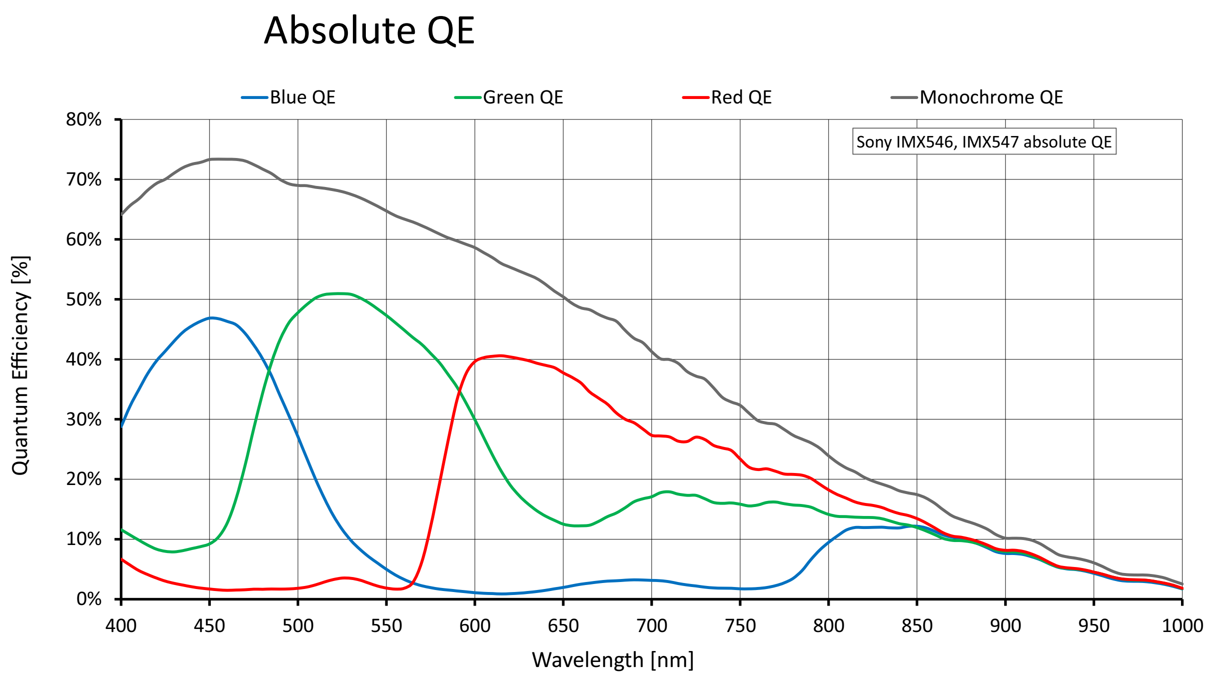



*Figure 48: Alvium 1800 U-811m/c (Sony IMX546) absolute QE*

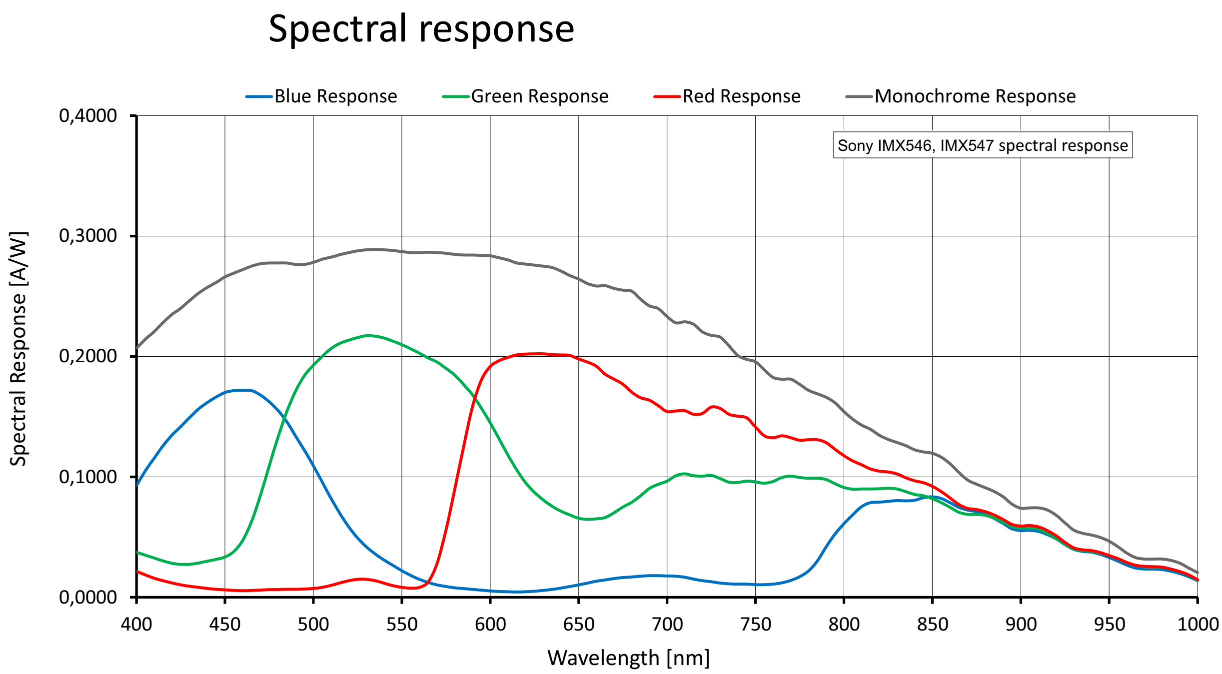



*Figure 49: Alvium 1800 U-811m/c (Sony IMX546) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2848 | 2848 | 8.111 | 51.3/25.8 | 43.4/21.8 | 23.2/11.7 |
| QSXGA | 2560 | 2048 | 5.243 | 77.5/39.1 | 65.5/33.0 | 35.2/17.7 |
| WQHD | 2560 | 1440 | 3.686 | 106.4/53.8 | 89.9/45.4 | 48.4/24.4 |
| QXGA | 2048 | 1536 | 3.146 | 104.7/63.6 | 104.7/53.6 | 57.0/28.8 |
| Full HD | 1920 | 1080 | 2.074 | 142.7/92.7 | 142.7/78.2 | 83.0/41.9 |
| UXGA | 1600 | 1200 | 1.92 | 130.8/101.0 | 130.8/85.3 | 90.9/45.9 |
| WXGA+ | 1440 | 900 | 1.296 | 167.0/143.8 | 167.0/121.0 | 129.0/65.0 |
| SXGA | 1280 | 1024 | 1.311 | 150.6/145.0 | 150.6/122.5 | 130.6/65.8 |
| HD 720 | 1280 | 720 | 0.922 | 201.8/194.5 | 201.8/164.4 | 175.3/88.4 |
| XGA | 1024 | 768 | 0.786 | 192.3/192.3 | | 192.3/105.1 |
| SVGA | 800 | 600 | 0.48 | 235.3/235.3 | | 235.3/163.5 |
| VGA | 640 | 480 | 0.307 | 279.8/279.8 | | 279.8/243.0 |
| HVGA | 480 | 320 | 0.154 | 373.1/373.1 | | 373.1/340.8 |
| QVGA | 320 | 240 | 0.077 | 447.2/447.2 | | 447.2/408.6 |
| HQVGA | 240 | 160 | 0.038 | 558.0/557.9 | | 557.9/510.2 |
| QQVGA | 160 | 120 | 0.019 | 636.8/636.8 | | 636.8/582.5 |
| Max. × half | 2848 | 1424 | 4.056 | 96.6/48.9 | 81.8/41.3 | 43.9/22.1 |
| Max. × min. | 2848 | 8 | 0.023 | 783.9/433.3 | 682.1/371.9 | 393.5/206.4 |
| Min. × max. | 8 | 2848 | 0.023 | 59.9/59.9 | | 59.9/54.6 |
| Min. × min. | 8 | 8 | 64 Px | 1053.9/1053.9 | | 1053.9/966.3 |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 73: Alvium 1800 U-811m/c ROI frame rates*

# Alvium 1800 U-812 UV

**NOTICE**

**Sensor aging by UV radiation**

The sensor in this camera model is dedicated for imaging in the UV spectrum. However, UV radiation causes aging, which is permanently increasing the dark current and decreasing the QE (quantum efficiency).

To reduce sensor aging, we recommend you to:

- Minimize the intensity of UV radiation.
- Avoid wavelengths below 250 nm. For example, consider the use of bandpass filters to block shorter wavelengths.

| Feature | Specification | |
|---|---|---|
| | 1800 U-812 (monochrome) | |
| Sensor model | Sony IMX487 | |
| Resolution | 2848 (H) × 2848 (V); 8.1 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 2/3; 7.8 mm × 7.8 mm; 11 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | |
| Maximum frame rate | 51 fps (at 450 MByte/s) | |
| Exposure time | 9 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.9 W<br>External power: 4.1 W | |

*Table 74: Alvium 1800 U-812 UV specifications (sheet 1 of 2)*

| Feature | Specification | | | |
|---|---|---|---|---|
| | 1800 U-812 UV | | | |
| Storage temperature | -20 °C to +85 °C ambient temperature | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 74: Alvium 1800 U-812 UV specifications (sheet 2 of 2)*

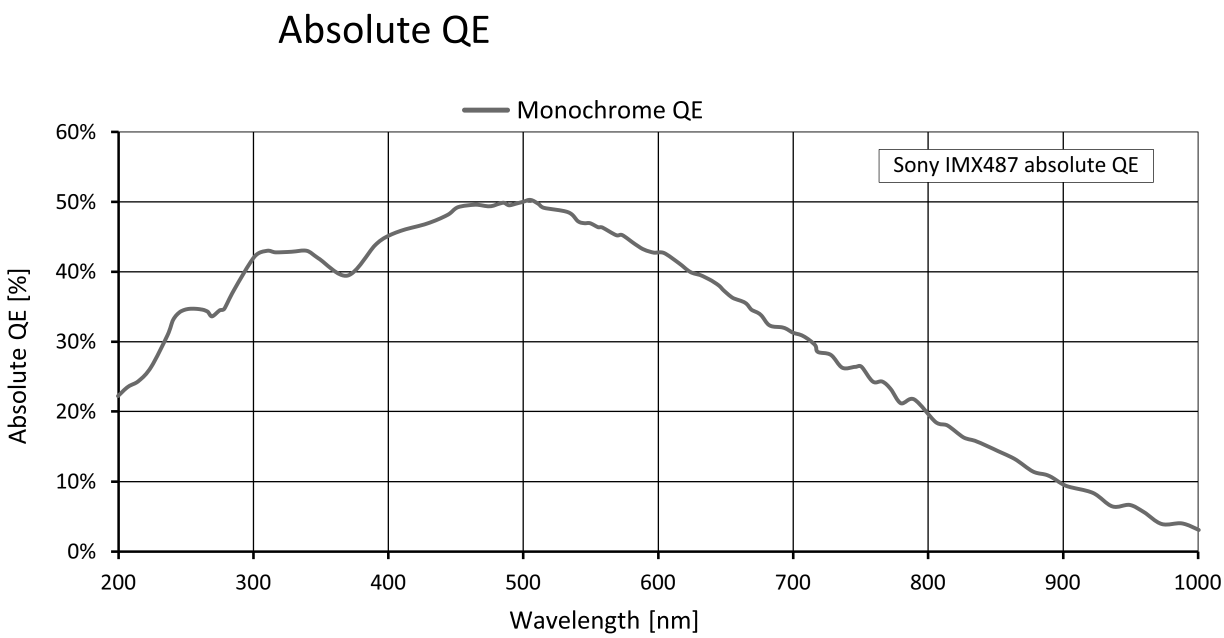



*Figure 50: Alvium 1800 U-812 UV (Sony IMX487) absolute QE*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 2848 | 2848 | 8.111 | 51.0/25.7 | 43.1/21.7 | 23.1/11.6 |
| QSXGA | 2560 | 2048 | 5.243 | 76.8/38.7 | 64.9/32.7 | 34.8/17.5 |
| WQHD | 2560 | 1440 | 3.686 | 105.1/53.1 | 88.9/44.9 | 47.8/24.1 |
| QXGA | 2048 | 1536 | 3.146 | 103.5/62.8 | 103.5/53.0 | 56.3/28.4 |
| Full HD | 1920 | 1080 | 2.074 | 139.6/90.6 | 139.6/76.5 | 81.1/40.9 |
| UXGA | 1600 | 1200 | 1.92 | 128.9/99.5 | 128.9/84.0 | 89.6/45.2 |
| WXGA+ | 1440 | 900 | 1.296 | 162.8/140.1 | 162.8/117.9 | 125.7/63.3 |
| SXGA | 1280 | 1024 | 1.311 | 148.1/142.7 | 148.1/120.5 | 128.5/64.7 |
| HD 720 | 1280 | 720 | 0.922 | 197.4/190.2 | 197.4/160.8 | 171.4/86.5 |
| XGA | 1024 | 768 | 0.786 | 188.3/188.3 | | 188.3/102.8 |
| SVGA | 800 | 600 | 0.48 | 227.0/227.0 | | 227.0/157.7 |
| VGA | 640 | 480 | 0.307 | 271.4/271.4 | | 271.4/235.6 |
| HVGA | 480 | 320 | 0.154 | 358.3/358.3 | | 358.3/327.2 |
| QVGA | 320 | 240 | 0.077 | 426.0/426.0 | | 426.0/389.3 |
| HQVGA | 240 | 160 | 0.038 | 525.4/525.4 | | 525.4/480.3 |
| QQVGA | 160 | 120 | 0.019 | 579.5/579.5 | | 579.5/529.9 |
| Max. × half | 2848 | 1424 | 4.056 | 95.4/48.3 | 80.8/40.8 | 43.4/21.8 |
| Max. × min. | 2848 | 8 | 0.023 | 687.2/375.0 | 595.7/321.1 | 340.0/177.2 |
| Min. × max. | 8 | 2848 | 0.023 | 59.5/59.5 | | 59.5/54.2 |
| Min. × min. | 8 | 8 | 64 Px | 905.6/905.6 | | 905.6/829.6 |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit / Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots **...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 75: Alvium 1800 U-812 UV ROI frame rates*

# Alvium 1800 U-895m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-895m (monochrome)** | **1800 U-895c (color)** |
| Sensor model | Sony IMX267 | |
| Resolution | 4112 (H) × 2176 (V); 8.95 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1; 14.2 mm × 7.5 mm; 16.0 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 31 fps (at ≥375 MByte/s) | |
| Exposure time | 29 µs to 10 s (375 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.8 W<br>External power: 2.8 W | |

[1] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 76: Alvium 1800 U-895m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-895m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 76: Alvium 1800 U-895m/c specifications (sheet 2 of 2)*

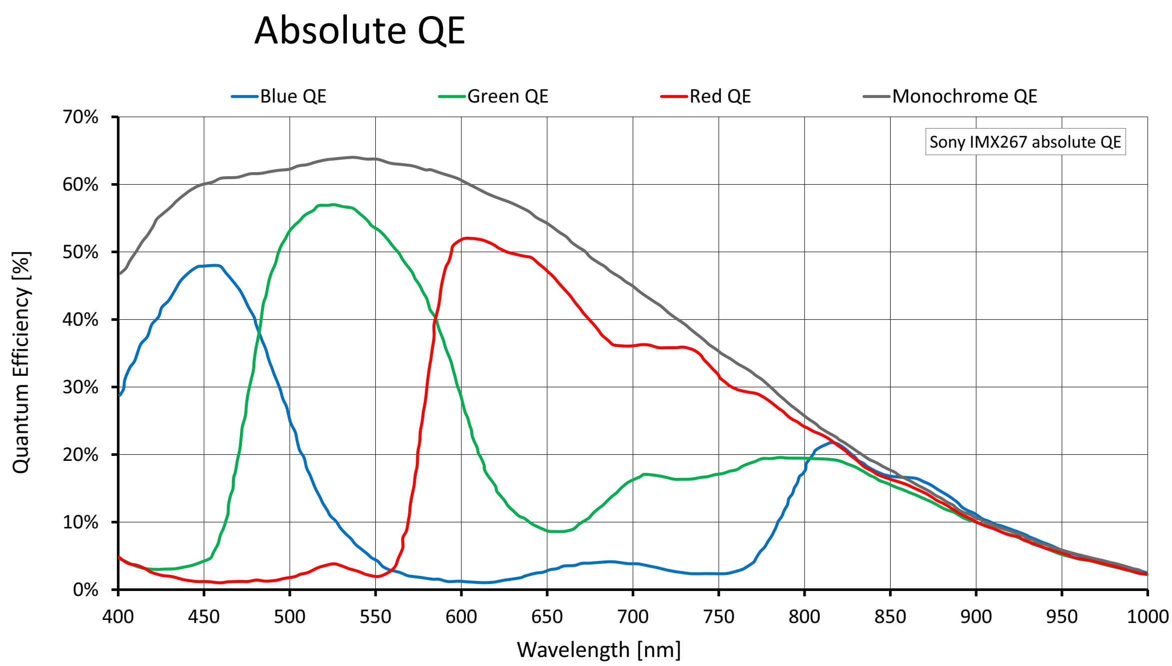



*Figure 51: Alvium 1800 U-895m/c (Sony IMX267) absolute QE*

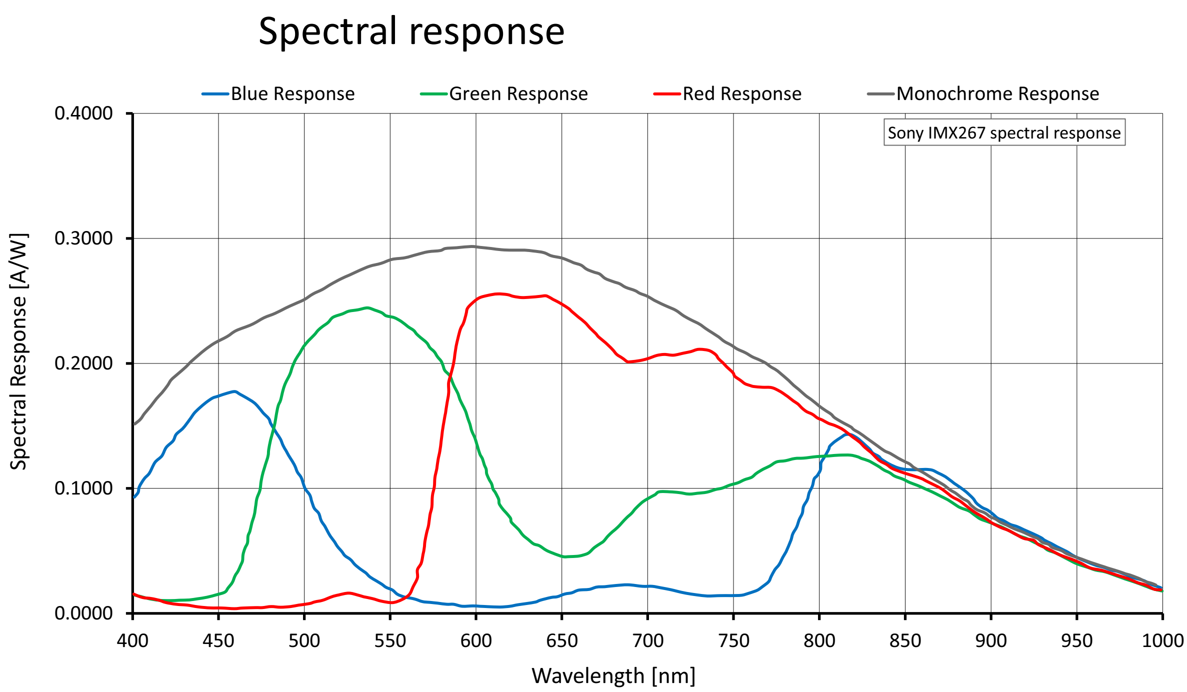



*Figure 52: Alvium 1800 U-895m/c (Sony IMX267) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 375 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 4112 | 2176 | 8.948 | 31.5/24.0 | 31.5/20.3 | 21.6/10.9 |
| UHD 4K | 3840 | 2160 | 8.294 | 31.8/25.9 | 31.8/21.9 | 23.3/11.8 |
| QSXGA | 2560 | 2048 | 5.243 | 33.6/33.6 | | 33.6/18.6 |
| WQHD | 2560 | 1440 | 3.686 | 47.2/47.2 | | 47.2/26.1 |
| QXGA | 2048 | 1536 | 3.146 | 44.5/44.5 | | 44.5/30.6 |
| Full HD | 1920 | 1080 | 2.074 | 62.3/62.3 | | 62.3/45.8 |
| UXGA | 1600 | 1200 | 1.92 | 56.5/56.5 | | 56.5/49.8 |
| WXGA+ | 1440 | 900 | 1.296 | 74.4/74.4 | | 74.4/72.3 |
| SXGA | 1280 | 1024 | 1.311 | 65.9/65.9 | | |
| HD 720 | 1280 | 720 | 0.922 | 91.8/91.8 | | |
| XGA | 1024 | 768 | 0.786 | 86.6/86.6 | | |
| SVGA | 800 | 600 | 0.48 | 109.2/109.2 | | |
| VGA | 640 | 480 | 0.307 | 134.4/134.4 | | |
| HVGA | 480 | 320 | 0.154 | 193.3/193.3 | | |
| QVGA | 320 | 240 | 0.077 | 247.8/247.8 | | |
| HQVGA | 240 | 160 | 0.038 | 345.2/345.2 | | |
| QQVGA | 160 | 120 | 0.019 | 428.4/428.4 | | |
| Max. × half | 4112 | 1088 | 4.474 | 60.9/46.6 | 60.9/39.4 | 42.0/21.3 |
| Max. × min. | 4112 | 8 | 0.033 | 808.2/684.0 | 808.2/606.6 | 638.5/379.9 |
| Min. × max. | 8 | 2176 | 0.017 | 32.0/32.0 | | |
| Min. × min. | 8 | 8 | 64 Px | 1317.0/1317.0 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit / Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 77: Alvium 1800 U-895m/c ROI frame rates*

# Alvium 1800 U-1236m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-1236m (monochrome)** | **1800 U-1236c (color)** |
| Sensor model | Sony IMX304 | |
| Resolution | 4112 (H) × 3008 (V); 12.4 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1.1; 14.2 mm × 10.4 mm; 17.6 mm diagonal | |
| Pixel size | 3.45 µm × 3.45 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 23 fps (at ≥300 MByte/s) | |
| Exposure time | 29 µs to 10 s (300 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Multiple ROI (H × V) | *Free* | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 2.9 W<br>External power: 3.1 W | |

[1] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 78: Alvium 1800 U-1236m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-1236m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +88 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 78: Alvium 1800 U-1236m/c specifications (sheet 2 of 2)*

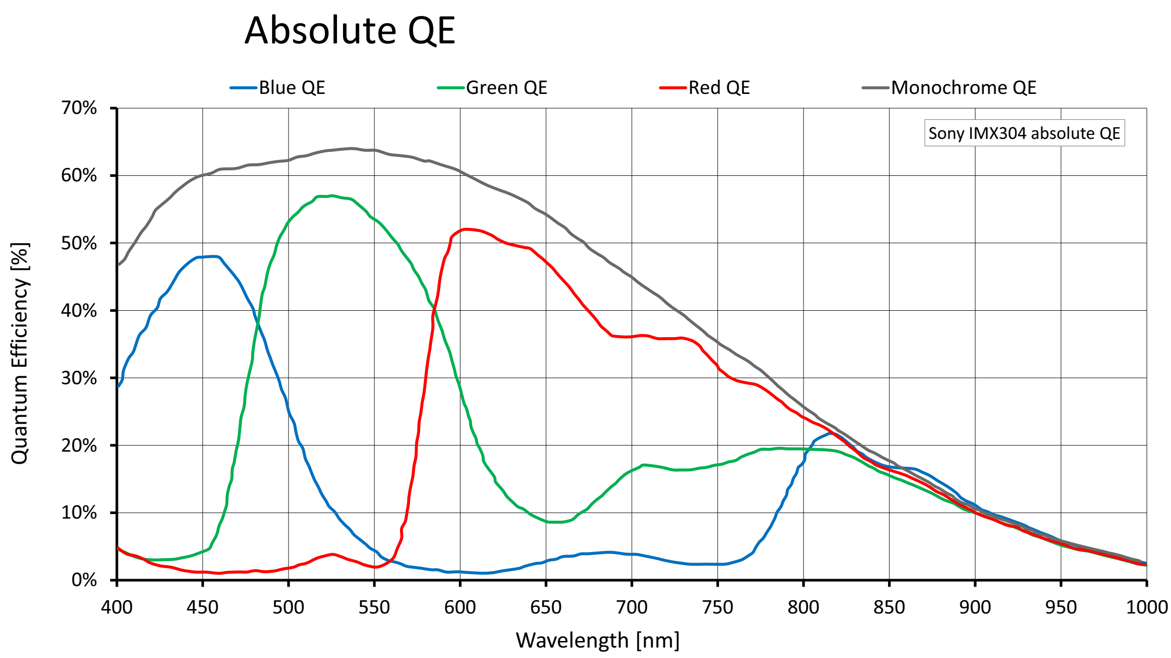



*Figure 53: Alvium 1800 U-1236m/c (Sony IMX304) absolute QE*

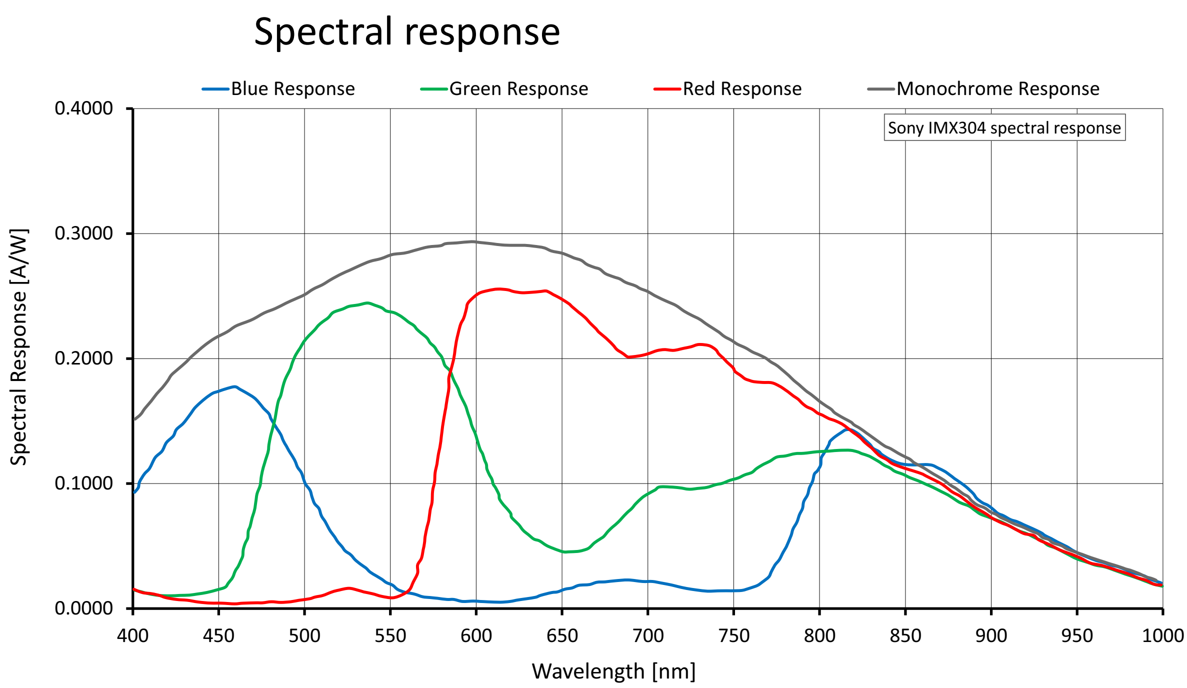



*Figure 54: Alvium 1800 U-1236m/c (Sony IMX304) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 300 MByte/s. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 4112 | 3008 | 12.369 | 23.0/17.5 | 23.0/14.8 | 15.7/7.9 |
| UHD 4K | 3840 | 2160 | 8.294 | 31.7/25.8 | 31.7/21.8 | 23.3/11.7 |
| QSXGA | 2560 | 2048 | 5.243 | 33.5/33.5 | | 33.5/18.5 |
| WQHD | 2560 | 1440 | 3.686 | 47.0/47.0 | | 47.0/26.0 |
| QXGA | 2048 | 1536 | 3.146 | 44.3/44.3 | | 44.3/30.5 |
| Full HD | 1920 | 1080 | 2.074 | 62.0/62.0 | | 62.0/45.5 |
| UXGA | 1600 | 1200 | 1.92 | 56.3/56.3 | | 56.3/49.5 |
| WXGA+ | 1440 | 900 | 1.296 | 73.9/73.9 | | 73.9/71.9 |
| SXGA | 1280 | 1024 | 1.311 | 65.5/65.5 | | |
| HD 720 | 1280 | 720 | 0.922 | 91.1/91.1 | | |
| XGA | 1024 | 768 | 0.786 | 86.0/86.0 | | |
| SVGA | 800 | 600 | 0.48 | 108.2/108.2 | | |
| VGA | 640 | 480 | 0.307 | 132.9/132.9 | | |
| HVGA | 480 | 320 | 0.154 | 190.2/190.2 | | |
| QVGA | 320 | 240 | 0.077 | 242.7/242.7 | | |
| HQVGA | 240 | 160 | 0.038 | 335.5/335.5 | | |
| QQVGA | 160 | 120 | 0.019 | 413.5/413.5 | | |
| Max. × half | 4112 | 1504 | 6.184 | 44.7/34.2 | 44.7/28.8 | 30.8/15.5 |
| Max. × min. | 4112 | 8 | 0.033 | 756.6/635.8 | 756.6/561.7 | 591.8/347.3 |
| Min. × max. | 8 | 3008 | 0.024 | 23.2/23.2 | | |
| Min. × min. | 8 | 8 | 64 Px | 1185.3/1185.3 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 79: Alvium 1800 U-1236m/c ROI frame rates*

# Alvium 1800 U-1240m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-1240m (monochrome) | 1800 U-1240c (color) |
| Sensor model | Sony IMX226 | |
| Resolution | 4024 (H) x 3036 (V); 12.2 MP | |
| Sensor type | CMOS | |
| Shutter type | Rolling shutter (RS) or Global reset shutter (GRS) | |
| Sensor size | Type 1/1.7; 7.4 mm × 5.6 mm; 9.3 mm diagonal | |
| Pixel size | 1.85 µm × 1.85 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 35 fps[1] (at 450 MByte/s) | |
| Exposure time | 11 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 27 dB; 0.1 dB increments | |
| Digital binning[2] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.1 W<br>External power: 3.3 W | |

[1] In triggered mode: ~34 fps (monochrome models); ~17 fps (color models)
[2] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 80: Alvium 1800 U-1240m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-1240m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[2]</td><td>Mainboard[3]</td></tr>
<tr><td>Bare board[4]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +88 °C</td></tr>
<tr><td>Open housing[5]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[2] See Mounting the heat sink on page 272.<br>[3] Output by <code>DeviceTemperature</code><br>[4] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[5] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 80: Alvium 1800 U-1240m/c specifications (sheet 2 of 2)*

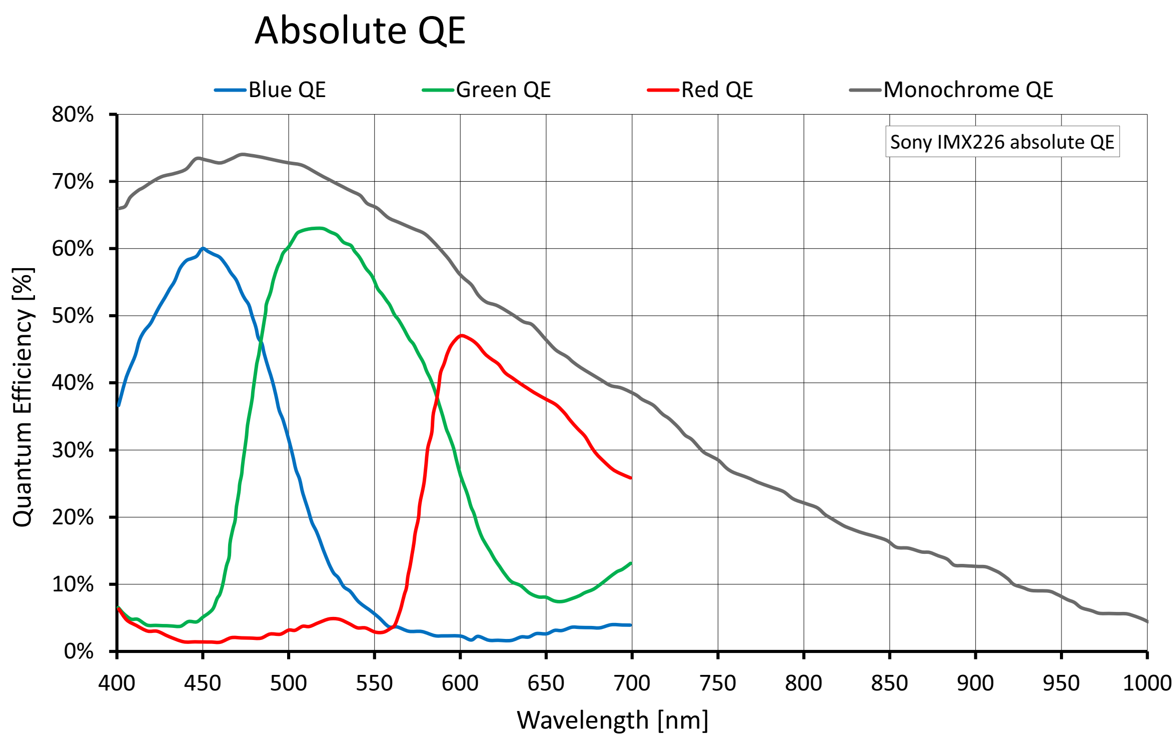



*Figure 55: Alvium 1800 U-1240m/c (Sony IMX226) absolute QE*

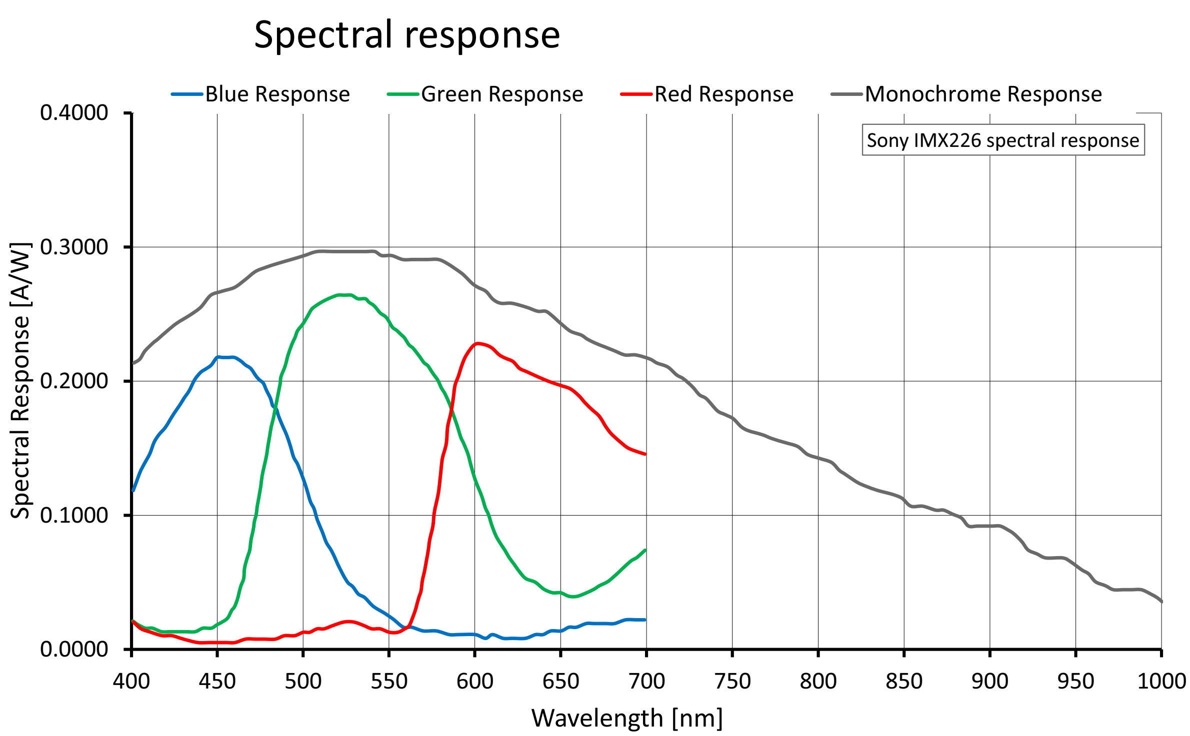



*Figure 56: Alvium 1800 U-1240m/c (Sony IMX226) spectral response*

## ROI frame rates

Values were measured for rolling shutter (RS) mode as defined in Specified values on page 77. Operation in global reset shutter mode produced identical values.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Shutter mode | User mode | Mono | Color | Available frame rates |
|---|---|---|---|---|
| Rolling shutter (RS) | Freerun | Values in Table 82 below are reached. | | |
| Rolling shutter (RS) | Triggered | >99% | >50% | ... of the values for in Table 82 below are reached. |
| Global reset shutter (GRS) | Freerun | >99% of the values for in Table 82 below are reached. | | |
| Global reset shutter (GRS) | Triggered | >99% | >50% | ... of the values for in Table 82 below are reached. |

*Table 81: Frame rate behavior for different configurations*

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 4024 | 3036 | 12.217 | 35.0/17.7 | 29.7/15.0 | 16.0/8.0 |
| UHD 4K | 3840 | 2160 | 8.294 | | | |
| QSXGA | 2560 | 2048 | 5.243 | | | |
| WQHD | 2560 | 1440 | 3.686 | | | |
| QXGA | 2048 | 1536 | 3.146 | | | |
| Full HD | 1920 | 1080 | 2.074 | | | |
| UXGA | 1600 | 1200 | 1.920 | | | |
| WXGA+ | 1440 | 900 | 1.296 | | | |
| SXGA | 1280 | 1024 | 1.311 | | | |
| HD 720 | 1280 | 720 | 0.922 | | | |
| XGA | 1024 | 768 | 0.786 | | | |
| SVGA | 800 | 600 | 0.480 | | | |
| VGA | 640 | 480 | 0.307 | | | |
| HVGA | 480 | 320 | 0.154 | | | |
| QVGA | 320 | 240 | 0.077 | | | |
| HQVGA | 240 | 160 | 0.038 | | | |
| QQVGA | 160 | 120 | 0.019 | | | |
| Max. × half | 4024 | 1518 | 6.108 | | | |
| Max. × min. | 4024 | 8 | 0.032 | | | |
| Min. × max. | 8 | 3036 | 0.024 | | | |
| Min. × min. | 8 | 8 | 64 Px | | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 10-Bit /
Mono10 or Bayer...10 at `SensorBitDepth` = 10-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 82: Alvium 1800 U-1240m/c ROI frame rates*

# Alvium 1800 U-1242m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-1242m (monochrome) | 1800 U-1242c (color) |
| Sensor model | Sony IMX545 | |
| Resolution | 4128 (H) × 3008 (V); 12.4 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1/1.1; 11.3 mm × 8.2 mm; 14.0 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 33 fps (at 450 MByte/s) | |
| Exposure time | 12 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (`Sum`) | Not applicable |
| Multiple ROI (H × V) | `Free` \| `Tile` \| `Horizontal`: 1 × 1 to 1 × 4 \| `Vertical`: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.4 W<br>External power: 3.6 W | |

[1] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 83: Alvium 1800 U-1242m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-1242m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 83: Alvium 1800 U-1242m/c specifications (sheet 2 of 2)*

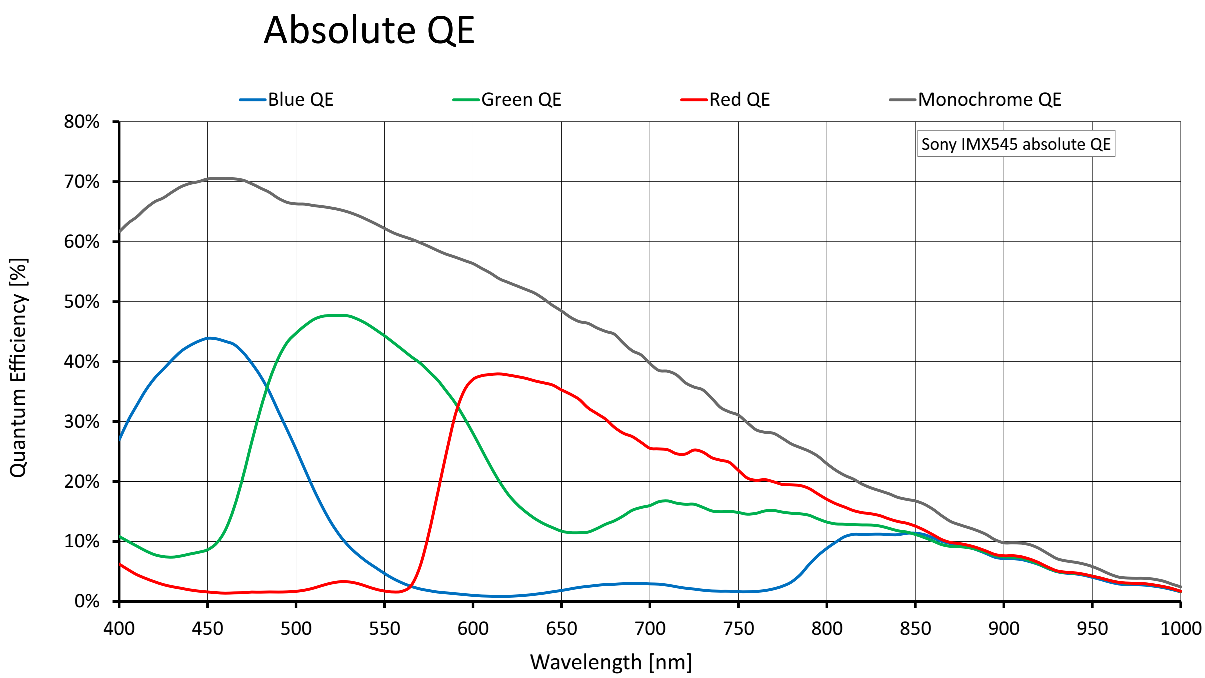



*Figure 57: Alvium 1800 U-1242m/c (Sony IMX545) absolute QE*

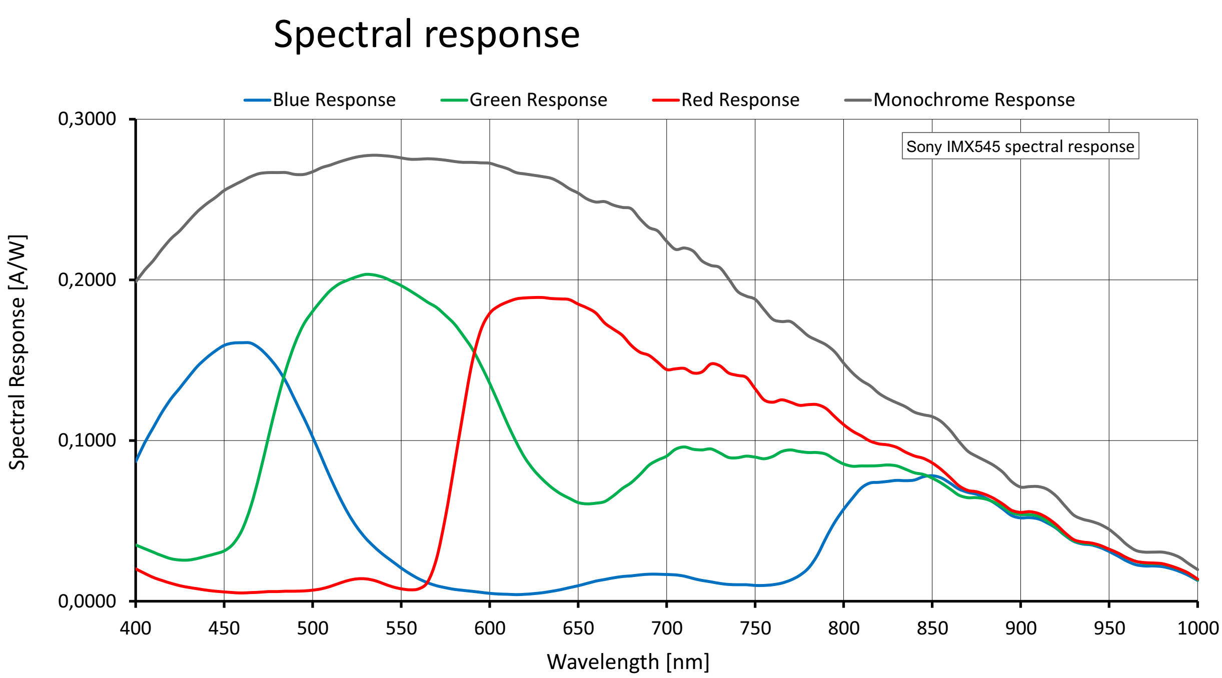



*Figure 58: Alvium 1800 U-1242m/c (Sony IMX545) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 4128 | 3008 | 12.417 | 33.9/17.1 | 28.5/14.4 | 15.3/7.7 |
| UHD 4K | 3840 | 2160 | 8.294 | 49.7/25.0 | 41.7/21.1 | 22.5/11.3 |
| QSXGA | 2560 | 2048 | 5.243 | 59.0/39.4 | 59.0/33.2 | 35.4/17.8 |
| WQHD | 2560 | 1440 | 3.686 | 81.4/54.3 | 81.4/45.9 | 48.9/24.6 |
| QXGA | 2048 | 1536 | 3.146 | 77.1/64.2 | 77.1/54.1 | 57.5/29.0 |
| Full HD | 1920 | 1080 | 2.074 | 105.5/93.9 | 105.5/79.2 | 84.0/42.4 |
| UXGA | 1600 | 1200 | 1.92 | 96.5/96.5 | 96.5/86.3 | 92.0/46.4 |
| WXGA+ | 1440 | 900 | 1.296 | 123.7/123.7 | 123.7/122.8 | 123.7/66.0 |
| SXGA | 1280 | 1024 | 1.311 | 111.2/111.2 | | 111.2/66.7 |
| HD 720 | 1280 | 720 | 0.922 | 149.9/149.9 | | 149.9/90.1 |
| XGA | 1024 | 768 | 0.786 | 142.6/142.6 | | 142.6/106.9 |
| SVGA | 800 | 600 | 0.48 | 175.0/175.0 | | 175.0/167.0 |
| VGA | 640 | 480 | 0.307 | 209.2/209.2 | | |
| HVGA | 480 | 320 | 0.154 | 281.7/281.7 | | |
| QVGA | 320 | 240 | 0.077 | 340.4/340.4 | | |
| HQVGA | 240 | 160 | 0.038 | 430.0/430.0 | | |
| QQVGA | 160 | 120 | 0.019 | 495.2/495.2 | | |
| Max. × half | 4128 | 1504 | 6.209 | 64.3/32.5 | 54.1/27.4 | 29.2/14.7 |
| Max. × min. | 4128 | 8 | 0.033 | 589.7/329.0 | 511.6/281.9 | 299.2/157.4 |
| Min. × max. | 8 | 3008 | 0.024 | 41.5/41.5 | | |
| Min. × min. | 8 | 8 | 64 Px | 860.0/860.0 | | |

[1] Mono8 or Bayer...8[2] at `SensorBitDepth` = 12-Bit / Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 84: Alvium 1800 U-1242m/c ROI frame rates*

# Alvium 1800 U-1620m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-1620m (monochrome)** | **1800 U-1620c (color)** |
| Sensor model | Sony IMX542 | |
| Resolution | 5328 (H) × 3040 (V); 16.2 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1.1; 14.6 mm × 8.3 mm; 16.8 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 26 fps (at 450 MByte/s) | |
| Exposure time | 15 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (`Sum`) | Not applicable |
| Multiple ROI (H × V) | `Free` \| `Tile` \| `Horizontal`: 1 × 1 to 1 × 4 \| `Vertical`: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 4.0 W<br>External power: 4.2 W | |

[1] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 85: Alvium 1800 U-1620m/c specifications (sheet 1 of 2)*

| Feature | Specification | | | |
|---|---|---|---|---|
| | 1800 U-1620m/c | | | |
| Storage temperature | -20 °C to +85 °C ambient temperature | | | |
| **Operating temperature** | **Hardware option** | **Housing** | **Cooling area**[1] | **Mainboard**[2] |
| | Bare board[3] | Not applicable | -20 °C to +85 °C | -20 °C to +85 °C |
| | Open housing[4] | -20 °C to +65 °C | | |
| | Closed housing | -20 °C to +65 °C | Not applicable | |
| Relative humidity | 0% to 80% (non-condensing) | | | |
| Digital interface | Micro-B USB 3.1 Gen 1 interface | | | |
| Camera controls | GenICam (GenICam Access) | | | |

[1] See Mounting the heat sink on page 272.
[2] Output by `DeviceTemperature`
[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.
[4] Temperature values must be observed for the housing **and** for the cooling area.

*Table 85: Alvium 1800 U-1620m/c specifications (sheet 2 of 2)*

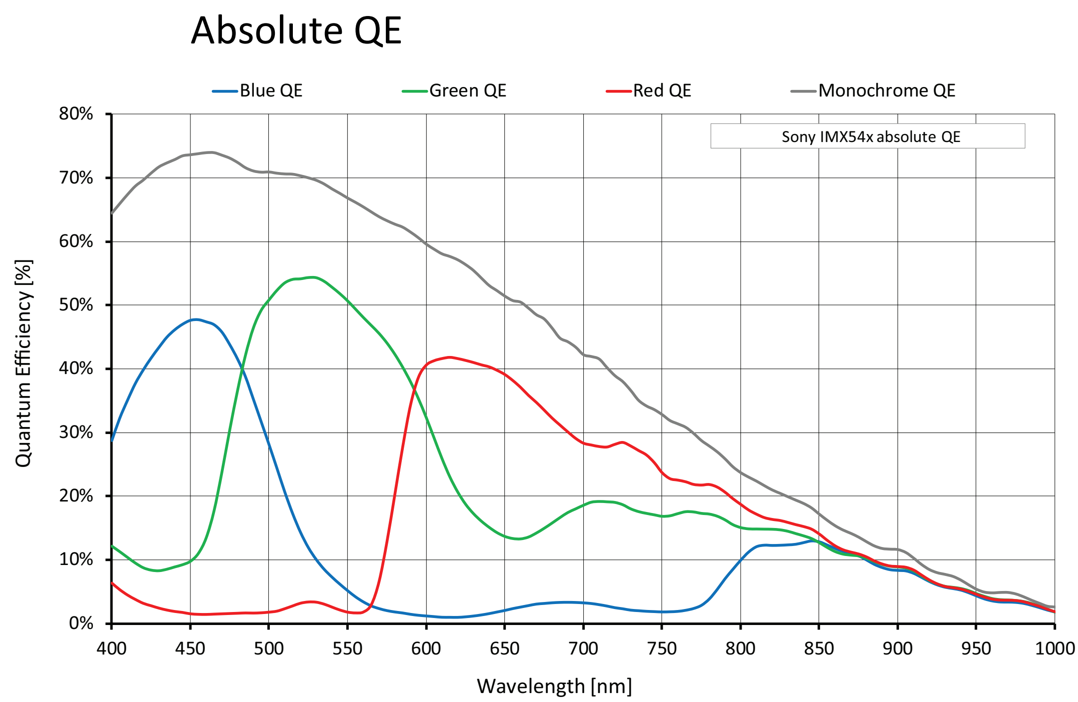



*Figure 59: Alvium 1800 U-1620m/c (Sony IMX542) absolute QE*

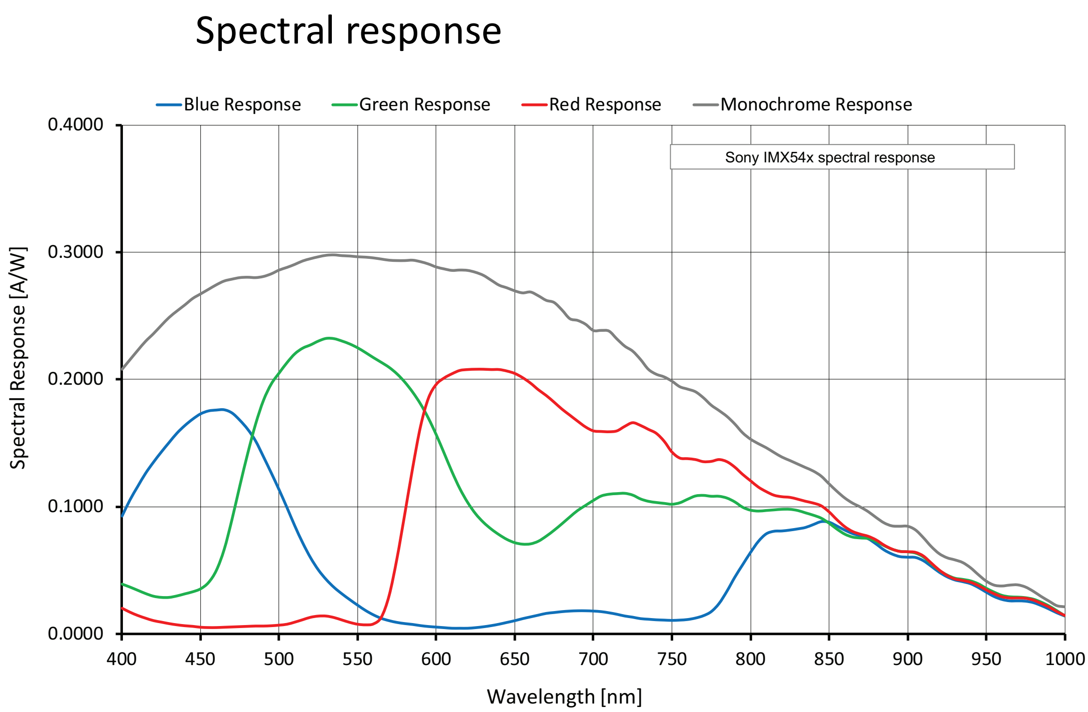



*Figure 60: Alvium 1800 U-1620m/c (Sony IMX542) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 5328 | 3040 | 16.197 | 26.2/13.2 | 22.0/11.1 | 11.8/5.9 |
| UHD 4K | 3840 | 2160 | 8.294 | 44.6/25.3 | 42.1/21.3 | 22.7/11.4 |
| QSXGA | 2560 | 2048 | 5.243 | 47.1/39.7 | 47.1/33.5 | 35.7/18.0 |
| WQHD | 2560 | 1440 | 3.686 | 65.3/55.0 | 65.3/46.5 | 49.6/25.0 |
| QXGA | 2048 | 1536 | 3.146 | 61.7/61.7 | 61.7/54.8 | 58.2/29.4 |
| Full HD | 1920 | 1080 | 2.074 | 84.9/84.9 | 84.9/80.5 | 84.9/43.1 |
| UXGA | 1600 | 1200 | 1.92 | 77.5/77.5 | | 77.5/47.1 |
| WXGA+ | 1440 | 900 | 1.296 | 99.7/99.7 | | 99.7/67.2 |
| SXGA | 1280 | 1024 | 1.311 | 89.4/89.4 | | 89.4/67.8 |
| HD 720 | 1280 | 720 | 0.922 | 121.5/121.5 | | 121.5/92.2 |
| XGA | 1024 | 768 | 0.786 | 115.2/115.2 | | 115.2/109.3 |
| SVGA | 800 | 600 | 0.48 | 142.2/142.2 | | |
| VGA | 640 | 480 | 0.307 | 171.0/171.0 | | |
| HVGA | 480 | 320 | 0.154 | 232.8/232.8 | | |
| QVGA | 320 | 240 | 0.077 | 284.1/284.1 | | |
| HQVGA | 240 | 160 | 0.038 | 364.4/364.4 | | |
| QQVGA | 160 | 120 | 0.019 | 424.4/424.4 | | |
| Max. × half | 5328 | 1520 | 8.099 | 49.9/25.2 | 42.1/21.3 | 22.7/11.4 |
| Max. × min. | 5328 | 8 | 0.043 | 513.0/290.3 | 447.8/249.3 | 264.1/140.1 |
| Min. × max. | 8 | 3040 | 0.024 | 32.6/32.6 | | |
| Min. × min. | 8 | 8 | 64 Px | 787.2/787.2 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 86: Alvium 1800 U-1620m/c ROI frame rates*

# Alvium 1800 U-2040m/c

| Feature | Specification | |
|---|---|---|
| | 1800 U-2040m (monochrome) | 1800 U-2040c (color) |
| Sensor model | Sony IMX541 | |
| Resolution | 4512 (H) × 4512 (V); 20.4 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1.1; 12.4 mm × 12.4 mm; 17.5 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 21 fps (at 450 MByte/s) | |
| Exposure time | 13 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (*Sum*) | Not applicable |
| Multiple ROI (H × V) | ***Free*** \| ***Tile*** \| ***Horizontal***: 1 × 1 to 1 × 4 \| ***Vertical***: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.9 W<br>External power: 4.1 W | |
| [1] Digital vertical binning can be used only when digital horizontal binning is used as well. | | |

*Table 87: Alvium 1800 U-2040m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-2040m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[1]</td><td>Mainboard[2]</td></tr>
<tr><td>Bare board[3]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[4]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[1] See Mounting the heat sink on page 272.<br>[2] Output by <code>DeviceTemperature</code><br>[3] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[4] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 87: Alvium 1800 U-2040m/c specifications (sheet 2 of 2)*

## Absolute QE

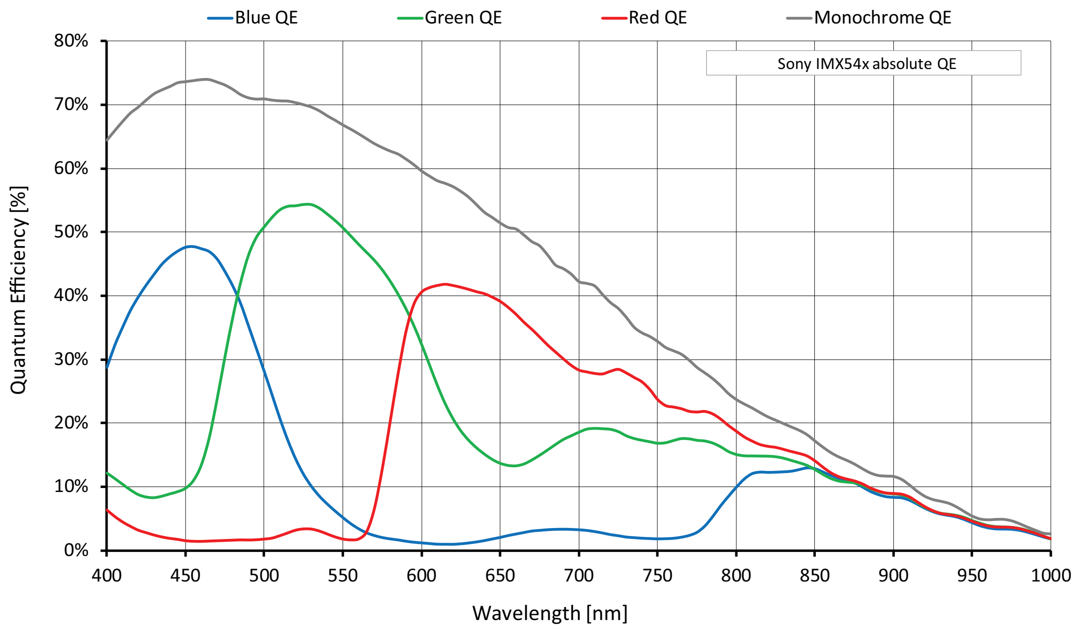



*Figure 61: Alvium 1800 U-2040m/c (Sony IMX541) absolute QE*

## Spectral response

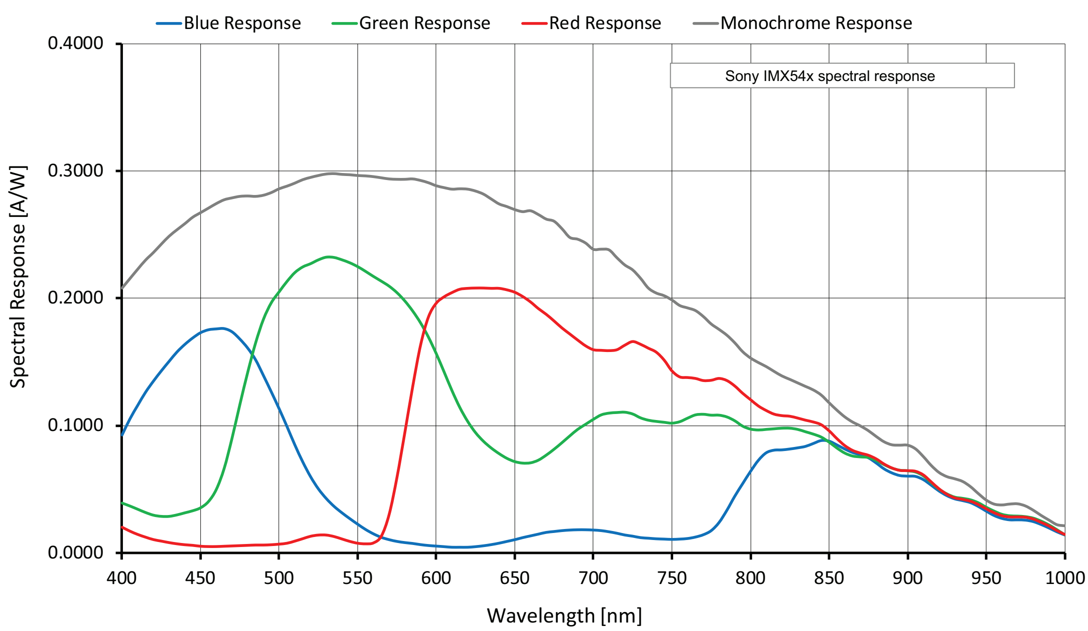



*Figure 62: Alvium 1800 U-2040m/c (Sony IMX541) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Image format | Width [pixels] | Height [pixels] | ROI area [MP] | Frame rate [fps][1] | | |
|---|---|---|---|---|---|---|
| | | | | 450 MByte/s | 375 MByte/s | 200 MByte/s |
| Full resolution | 4512 | 4512 | 20.358 | 21.1/10.6 | 17.8/8.9 | 9.5/4.8 |
| HXGA | 4096 | 3072 | 12.583 | 33.6/16.9 | 28.4/14.3 | 15.2/7.6 |
| UHD 4K | 3840 | 2160 | 8.294 | 50.1/25.2 | 42.1/21.3 | 22.6/11.4 |
| QSXGA | 2560 | 2048 | 5.243 | 55.0/39.7 | 55.0/33.5 | 35.7/18.0 |
| WQHD | 2560 | 1440 | 3.686 | 76.0/55.0 | 76.0/46.4 | 49.5/24.9 |
| QXGA | 2048 | 1536 | 3.146 | 71.9/64.8 | 71.9/54.7 | 58.1/29.4 |
| Full HD | 1920 | 1080 | 2.074 | 98.9/95.3 | 98.9/80.4 | 85.3/43.0 |
| UXGA | 1600 | 1200 | 1.92 | 90.2/90.2 | 90.2/87.4 | 90.2/47.1 |
| WXGA+ | 1440 | 900 | 1.296 | 116.1/116.1 | | 116.1/67.1 |
| SXGA | 1280 | 1024 | 1.311 | 104.2/104.2 | | 104.2/67.7 |
| HD 720 | 1280 | 720 | 0.922 | 141.3/141.3 | | 141.3/92.0 |
| XGA | 1024 | 768 | 0.786 | 134.2/134.2 | | 134.2/109.0 |
| SVGA | 800 | 600 | 0.48 | 165.6/165.6 | | |
| VGA | 640 | 480 | 0.307 | 198.9/198.9 | | |
| HVGA | 480 | 320 | 0.154 | 270.3/270.3 | | |
| QVGA | 320 | 240 | 0.077 | 329.3/329.3 | | |
| HQVGA | 240 | 160 | 0.038 | 421.5/421.5 | | |
| QQVGA | 160 | 120 | 0.019 | 490.0/490.0 | | |
| Max. × half | 4512 | 2256 | 10.179 | 40.9/20.6 | 34.4/17.4 | 18.5/9.3 |
| Max. × min. | 4512 | 8 | 0.036 | 598.4/338.1 | 521.2/290.4 | 307.7/163.1 |
| Min. × max. | 8 | 4512 | 0.036 | 26.0/26.0 | | |
| Min. × min. | 8 | 8 | 64 Px | 899.5/899.5 | | |

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit /
Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit

[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.

*Table 88: Alvium 1800 U-2040m/c ROI frame rates*

# Alvium 1800 U-2050m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-2050m (monochrome)** | **1800 U-2050c (color)** |
| Sensor model | Sony IMX183 | |
| Resolution | 5496 (H) × 3672 (V); 20.2 MP | |
| Sensor type | CMOS | |
| Shutter type | Rolling shutter (RS) or Global reset shutter (GRS) | |
| Sensor size | Type 1; 13.1 mm × 8.8 mm; 15.9 mm diagonal | |
| Pixel size | 2.4 µm × 2.4 µm | |
| CRA | 3 deg | |
| Sensor bit depth (ADC) | 10-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 21 fps[1] (at 450 MByte/s) | |
| Exposure time | 15 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed | |
| Gain | 0 dB to 27 dB; 0.1 dB increments | |
| Digital binning[2] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 3.2 W<br>External power: 3.4 W | |

[1] In triggered mode: ~21 fps (monochrome models); ~10 fps (color models)

[2] Digital vertical binning can be used only when digital horizontal binning is used as well.

*Table 89: Alvium 1800 U-2050m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-2050m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[2]</td><td>Mainboard[3]</td></tr>
<tr><td>Bare board[4]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +88 °C</td></tr>
<tr><td>Open housing[5]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[2] See Mounting the heat sink on page 272.<br>[3] Output by <code>DeviceTemperature</code><br>[4] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[5] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 89: Alvium 1800 U-2050m/c specifications (sheet 2 of 2)*

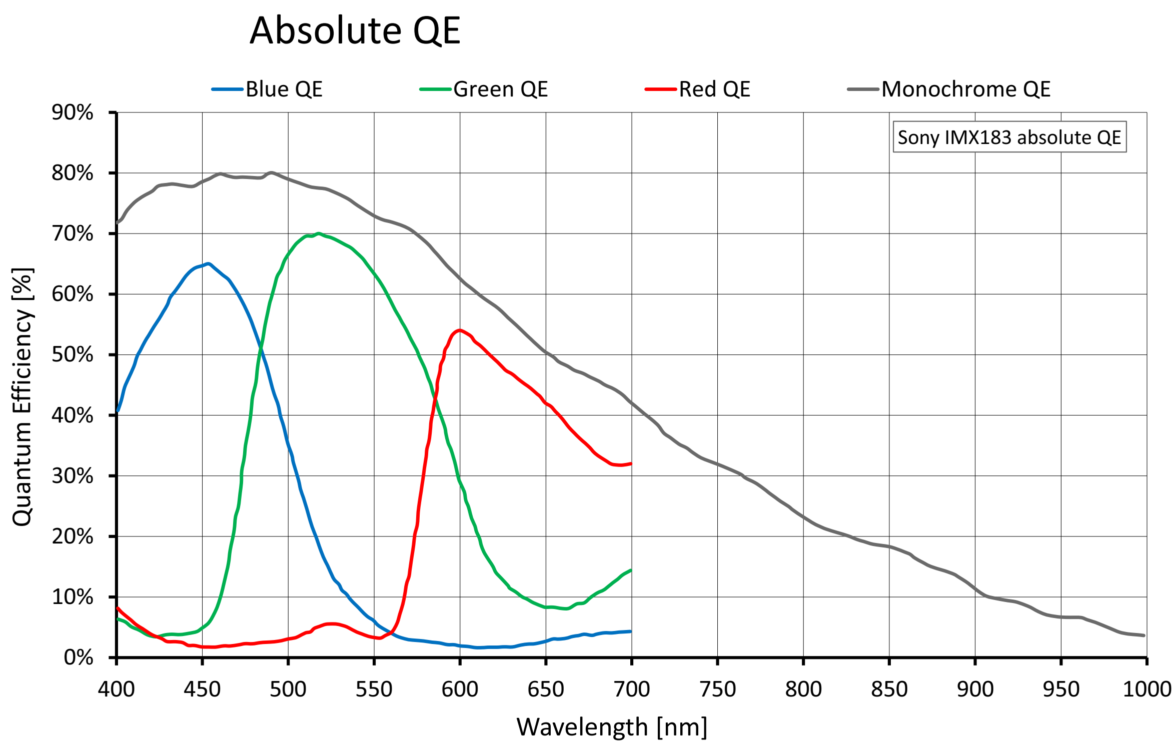



*Figure 63: Alvium 1800 U-2050m/c (Sony IMX183) absolute QE*

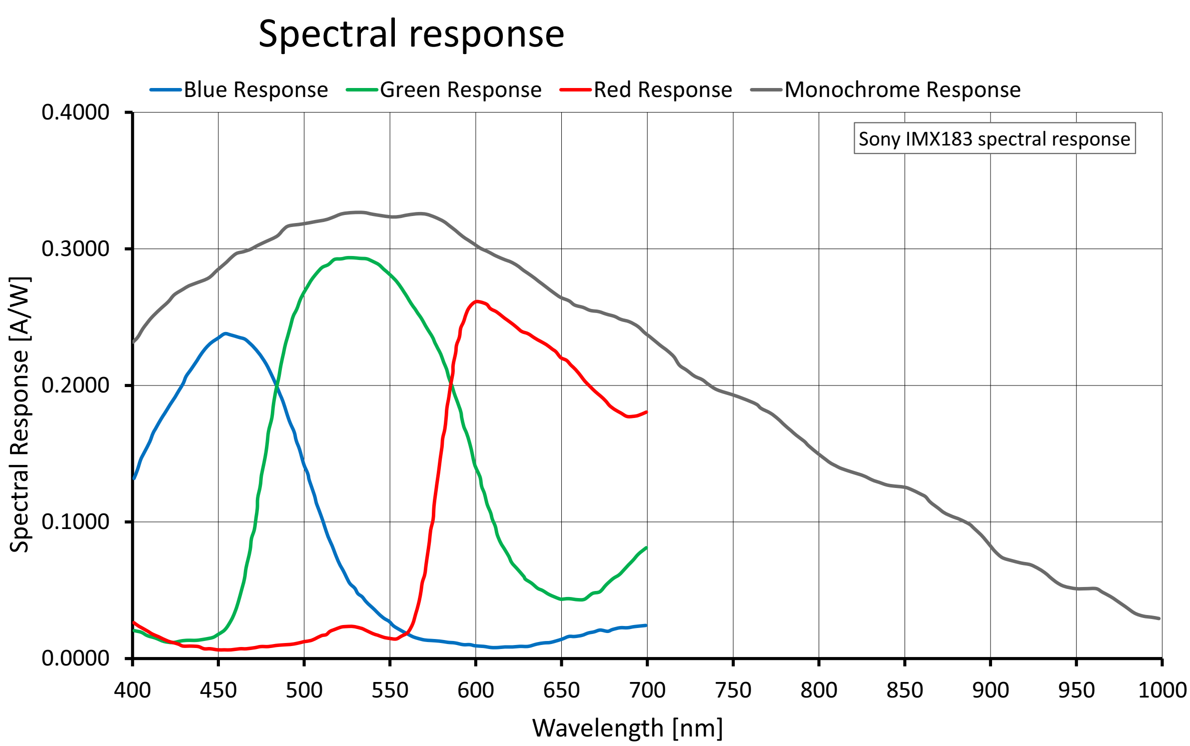



*Figure 64: Alvium 1800 U-2050m/c (Sony IMX183) spectral response*

## ROI frame rates

Values were measured for rolling shutter (RS) mode as defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

| Shutter mode | User mode | Mono | Color | Available frame rates |
|---|---|---|---|---|
| Rolling shutter (RS) | Freerun | Values in Table 91 below are reached. | | |
| Rolling shutter (RS) | Triggered | >99% | >50% | ... of the values for in Table 91 below are reached. |
| Global reset shutter (GRS) | Freerun | >99% of the values for in Table 91 below are reached. | | |
| Global reset shutter (GRS) | Triggered | >99% | >50% | ... of the values for in Table 91 below are reached. |

*Table 90: Frame rate behavior for different configurations*

<table>
<tr><th rowspan="2">Image format</th><th rowspan="2">Width [pixels]</th><th rowspan="2">Height [pixels]</th><th rowspan="2">ROI area [MP]</th><th colspan="3">Frame rate [fps][1]</th></tr>
<tr><th>450 MByte/s</th><th>375 MByte/s</th><th>200 MByte/s</th></tr>
<tr><td>Full resolution</td><td>5496</td><td>3672</td><td>20.181</td><td>21.4/10.7</td><td>18.1/9.1</td><td>9.7/4.9</td></tr>
<tr><td>HXGA</td><td>4096</td><td>3072</td><td>12.583</td><td>25.4/12.8</td><td>21.5/10.8</td><td>11.5/5.8</td></tr>
<tr><td>UHD 4K</td><td>3840</td><td>2160</td><td>8.294</td><td>35.6/18.0</td><td>30.1/15.2</td><td>16.2/8.1</td></tr>
<tr><td>QSXGA</td><td>2560</td><td>2048</td><td>5.243</td><td>37.4/18.9</td><td>31.7/16.0</td><td>17.0/8.6</td></tr>
<tr><td>WQHD</td><td>2560</td><td>1440</td><td>3.686</td><td rowspan="16">41.2/20.9</td><td rowspan="16">34.9/17.6</td><td rowspan="16">18.8/9.5</td></tr>
<tr><td>QXGA</td><td>2048</td><td>1536</td><td>3.146</td></tr>
<tr><td>Full HD</td><td>1920</td><td>1080</td><td>2.074</td></tr>
<tr><td>UXGA</td><td>1600</td><td>1200</td><td>1.92</td></tr>
<tr><td>WXGA+</td><td>1440</td><td>900</td><td>1.296</td></tr>
<tr><td>SXGA</td><td>1280</td><td>1024</td><td>1.311</td></tr>
<tr><td>HD 720</td><td>1280</td><td>720</td><td>0.922</td></tr>
<tr><td>XGA</td><td>1024</td><td>768</td><td>0.786</td></tr>
<tr><td>SVGA</td><td>800</td><td>600</td><td>0.48</td></tr>
<tr><td>VGA</td><td>640</td><td>480</td><td>0.307</td></tr>
<tr><td>HVGA</td><td>480</td><td>320</td><td>0.154</td></tr>
<tr><td>QVGA</td><td>320</td><td>240</td><td>0.077</td></tr>
<tr><td>HQVGA</td><td>240</td><td>160</td><td>0.038</td></tr>
<tr><td>QQVGA</td><td>160</td><td>120</td><td>0.019</td></tr>
<tr><td>Max. × half</td><td>5496</td><td>1836</td><td>10.091</td></tr>
<tr><td>Max. × min.</td><td>5496</td><td>8</td><td>0.044</td></tr>
<tr><td>Min. × max.</td><td>8</td><td>3672</td><td>0.029</td><td>21.4/10.7</td><td>18.1/9.1</td><td>9.7/4.9</td></tr>
<tr><td>Min. × min.</td><td>8</td><td>8</td><td>64 Px</td><td>41.2/20.9</td><td>34.9/17.6</td><td>17.7/9.5</td></tr>
<tr><td colspan="7">[1] Mono8 or Bayer...8[2] at <code>SensorBitDepth</code> = 10-Bit /<br>Mono10 or Bayer...10 at <code>SensorBitDepth</code> = 10-Bit<br>[2] The three dots... represent the colors of a Bayer pixel format, such as in BayerRG8.</td></tr>
</table>

*Table 91: Alvium 1800 U-2050m/c ROI frame rates*

## Alvium 1800 U-2460m/c

| Feature | Specification | |
|---|---|---|
| | **1800 U-2460m (monochrome)** | **1800 U-2460c (color)** |
| Sensor model | Sony IMX540 | |
| Resolution | 5328 (H) × 4608 (V); 24.6 MP | |
| Sensor type | CMOS | |
| Shutter type | Global shutter (GS) | |
| Sensor size | Type 1.2; 14.6 mm × 12.6 mm; 19.3 mm diagonal | |
| Pixel size | 2.74 µm × 2.74 µm | |
| CRA | 0 deg | |
| Sensor bit depth (ADC) | 12-bit | |
| Monochrome pixel formats | Mono8 (default), Mono10, Mono10p, Mono12, Mono12p | Mono8, Mono10, Mono10p, Mono12, Mono12p |
| YUV color pixel formats | Not applicable | YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr |
| RGB color pixel formats | Not applicable | BGR8, RGB8 (default) |
| Raw color pixel formats | Not applicable | BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p |
| Maximum frame rate | 17 fps (at 450 MByte/s) | |
| Exposure time | 15 µs to 10 s (450 MByte/s) | |
| Exposure modes | Timed, TriggerControlled, TriggerWidth | |
| Gain | 0 dB to 48 dB; 0.1 dB increments | |
| Digital binning[1] | Horizontal: 1 to 8 columns; Vertical: 1 to 8 rows | |
| Sensor binning (H × V) | 2 × 2 (`Sum`) | Not applicable |
| Multiple ROI (H × V) | `Free` \| `Tile` \| `Horizontal`: 1 × 1 to 1 × 4 \| `Vertical`: 1 × 1 to 1 × 4 | |
| Image buffer (RAM) | 256 KByte | |
| Non-volatile memory (Flash) | 1024 KByte | |
| GPIOs | 4 programmable GPIOs<br>As direct inputs (push-pull): 0 to 5.5 VDC<br>As direct outputs (push-pull): 0 to 3.3 VDC at 12 mA | |
| Power requirements | Power over USB; External power | |
| Power consumption (typical, at 5 VDC) | USB power: 4.0 W<br>External power: 4.2 W | |
| [1] Digital vertical binning can be used only when digital horizontal binning is used as well. | | |

*Table 92: Alvium 1800 U-2460m/c specifications (sheet 1 of 2)*

<table>
<tr><th>Feature</th><th colspan="4">Specification</th></tr>
<tr><th></th><th colspan="4">1800 U-2460m/c</th></tr>
<tr><td>Storage temperature</td><td colspan="4">-20 °C to +85 °C ambient temperature</td></tr>
<tr><td rowspan="4">Operating temperature</td><td>Hardware option</td><td>Housing</td><td>Cooling area[2]</td><td>Mainboard[3]</td></tr>
<tr><td>Bare board[4]</td><td>Not applicable</td><td rowspan="2">-20 °C to +85 °C</td><td rowspan="3">-20 °C to +85 °C</td></tr>
<tr><td>Open housing[5]</td><td>-20 °C to +65 °C</td></tr>
<tr><td>Closed housing</td><td>-20 °C to +65 °C</td><td>Not applicable</td></tr>
<tr><td>Relative humidity</td><td colspan="4">0% to 80% (non-condensing)</td></tr>
<tr><td>Digital interface</td><td colspan="4">Micro-B USB 3.1 Gen 1 interface</td></tr>
<tr><td>Camera controls</td><td colspan="4">GenICam (GenICam Access)</td></tr>
<tr><td colspan="5">[2] See Mounting the heat sink on page 272.<br>[3] Output by <code>DeviceTemperature</code><br>[4] Ensure that the sensor is operated in the temperature range specified by the manufacturer. For any questions, please visit www.alliedvision.com/en/support.<br>[5] Temperature values must be observed for the housing and for the cooling area.</td></tr>
</table>

*Table 92: Alvium 1800 U-2460m/c specifications (sheet 2 of 2)*

## Absolute QE

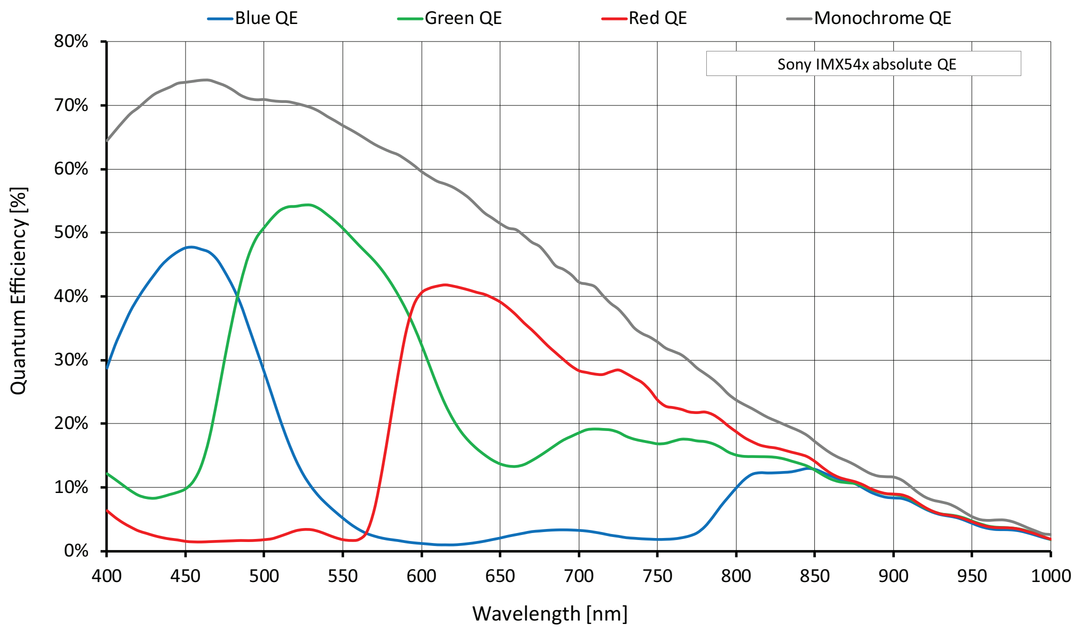



*Figure 65: Alvium 1800 U-2460m/c (Sony IMX540) absolute QE*

## Spectral response

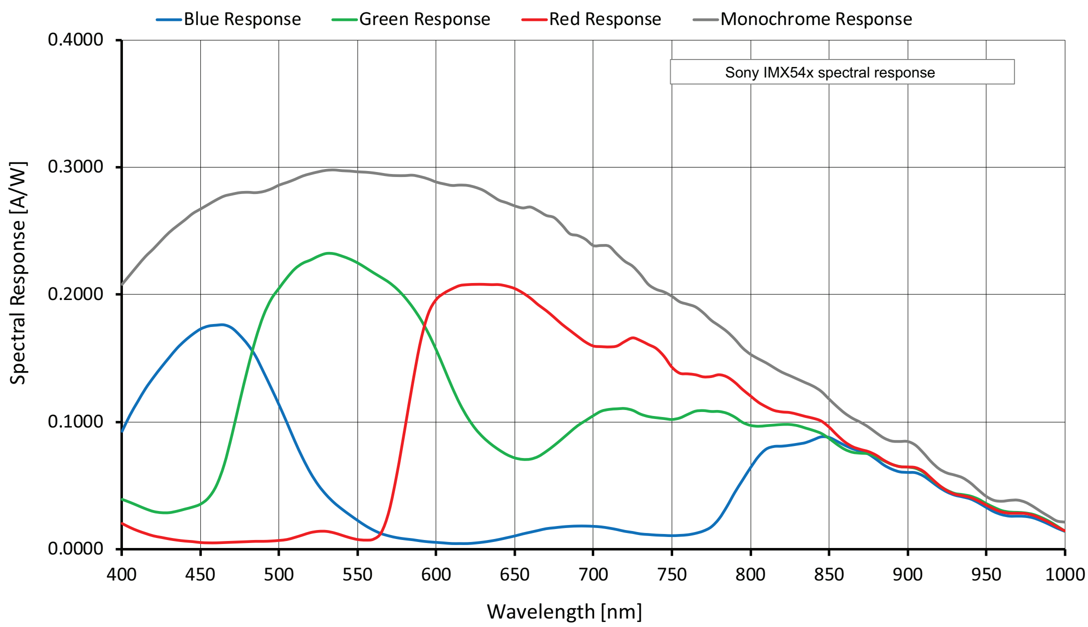



*Figure 66: Alvium 1800 U-2460m/c (Sony IMX540) spectral response*

## ROI frame rates

Values are based on the conditions defined in Specified values on page 77.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MByte/s.

<table>
<tr><th rowspan="2">Image format</th><th rowspan="2">Width [pixels]</th><th rowspan="2">Height [pixels]</th><th rowspan="2">ROI area [MP]</th><th colspan="3">Frame rate [fps][1]</th></tr>
<tr><th>450 MByte/s</th><th>375 MByte/s</th><th>200 MByte/s</th></tr>
<tr><td>Full resolution</td><td>5328</td><td>4608</td><td>24.551</td><td>17.6/8.8</td><td>14.8/7.4</td><td>7.9/4.0</td></tr>
<tr><td>HSXGA</td><td>5120</td><td>4096</td><td>20.972</td><td>20.4/10.3</td><td>17.2/8.7</td><td>9.2/4.6</td></tr>
<tr><td>HXGA</td><td>4096</td><td>3072</td><td>12.583</td><td>32.0/16.9</td><td>28.4/14.3</td><td>15.2/7.6</td></tr>
<tr><td>UHD 4K</td><td>3840</td><td>2160</td><td>8.294</td><td>44.6/25.3</td><td>42.1/21.3</td><td>22.7/11.4</td></tr>
<tr><td>QSXGA</td><td>2560</td><td>2048</td><td>5.243</td><td>47.1/39.7</td><td>47.1/33.5</td><td>35.7/18.0</td></tr>
<tr><td>WQHD</td><td>2560</td><td>1440</td><td>3.686</td><td>65.3/55.0</td><td>65.3/46.5</td><td>49.6/25.0</td></tr>
<tr><td>QXGA</td><td>2048</td><td>1536</td><td>3.146</td><td>61.7/61.7</td><td>61.7/54.8</td><td>58.2/29.4</td></tr>
<tr><td>Full HD</td><td>1920</td><td>1080</td><td>2.074</td><td>84.9/84.9</td><td>84.9/80.5</td><td>84.9/43.1</td></tr>
<tr><td>UXGA</td><td>1600</td><td>1200</td><td>1.92</td><td colspan="2">77.5/77.5</td><td>77.5/47.1</td></tr>
<tr><td>WXGA+</td><td>1440</td><td>900</td><td>1.296</td><td colspan="2">99.7/99.7</td><td>99.7/67.2</td></tr>
<tr><td>SXGA</td><td>1280</td><td>1024</td><td>1.311</td><td colspan="2">89.4/89.4</td><td>89.4/67.8</td></tr>
<tr><td>HD 720</td><td>1280</td><td>720</td><td>0.922</td><td colspan="2">121.5/121.5</td><td>121.5/92.2</td></tr>
<tr><td>XGA</td><td>1024</td><td>768</td><td>0.786</td><td colspan="2">115.2/115.2</td><td>115.2/109.3</td></tr>
<tr><td>SVGA</td><td>800</td><td>600</td><td>0.48</td><td colspan="2">142.2/142.2</td><td>142.2/142.2</td></tr>
<tr><td>VGA</td><td>640</td><td>480</td><td>0.307</td><td colspan="2">171.0/171.0</td><td>171.0/171.0</td></tr>
<tr><td>HVGA</td><td>480</td><td>320</td><td>0.154</td><td colspan="3">232.8/232.8</td></tr>
<tr><td>QVGA</td><td>320</td><td>240</td><td>0.077</td><td colspan="3">284.1/284.1</td></tr>
<tr><td>HQVGA</td><td>240</td><td>160</td><td>0.038</td><td colspan="3">364.4/364.4</td></tr>
<tr><td>QQVGA</td><td>160</td><td>120</td><td>0.019</td><td colspan="3">424.4/424.4</td></tr>
<tr><td>Max. × half</td><td>5328</td><td>2304</td><td>12.276</td><td>34.0/17.1</td><td>28.7/14.4</td><td>15.4/7.7</td></tr>
<tr><td>Max. × min.</td><td>5328</td><td>8</td><td>0.043</td><td>513.0/290.3</td><td>447.8/249.3</td><td>264.1/140.1</td></tr>
<tr><td>Min. × max.</td><td>8</td><td>4608</td><td>0.037</td><td>21.8/21.8</td><td>21.8/21.8</td><td>21.8/21.8</td></tr>
<tr><td>Min. × min.</td><td>8</td><td>8</td><td>64 Px</td><td>787.2/787.2</td><td>787.2/787.2</td><td>787.2/787.2</td></tr>
<tr><td colspan="7">[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 12-Bit /<br>Mono12 or Bayer...12 at `SensorBitDepth` = 12-Bit<br>[2] The three dots**...** represent the colors of a Bayer pixel format, such as in Bayer**RG**8.</td></tr>
</table>

*Table 93: Alvium 1800 U-2460m/c ROI frame rates*

# White balance default

Alvium color cameras are balanced for neutral color reproduction with an illumination of 5000 °K (warm daylight). Table 94 shows default values for the red and blue channel by model.

For different illuminations, use auto white balance or adapt the color channel values manually.

**Feature description**

See the Alvium Features Reference at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

**Exceptions and sensor characteristics**

- White balance default does not apply to **monochrome and Pol models**.
- Especially with long exposure times, bright image areas of **e2v EV76C5x Saphire sensors** may appear slightly pink: At maximum saturation, the output for red and green is 255 as expected, while the output for green drops down to approximately 240. Therefore, we recommend to slightly underexpose images to reduce this effect.

| Alvium model | Sensor model | Red channel value | Blue channel value |
|---|---|---|---|
| 1800 U-040c | Sony IMX287 | 2.360 | 2.030 |
| 1800 U-050c | ON Semiconductor PYTHON 480 | 1.930 | 1.500 |
| 1800 U-052c | Sony IMX426 | 2.290 | 2.000 |
| 1800 U-120c | ON Semiconductor AR0135CS | 1.760 | 1.650 |
| 1800 U-131c | e2v EV76C560 | 1.390 | 1.270 |
| 1800 U-158c | Sony IMX273 | 2.355 | 2.100 |
| 1800 U-192c | e2v EV76C570 | 1.390 | 1.270 |
| 1800 U-203c | Sony IMX422 | 2.290 | 2.000 |
| 1800 U-234c | Sony IMX249 | 2.580 | 1.810 |
| 1800 U-235c | Sony IMX174 | 2.580 | 1.810 |
| 1800 U-240c | Sony IMX392 | 2.355 | 2.100 |
| 1800 U-291c | Sony IMX421 | 2.290 | 2.000 |
| 1800 U-319c | Sony IMX265 | 2.355 | 2.100 |
| 1800 U-500c | ON Semiconductor AR0521SR | 2.120 | 1.520 |
| 1800 U-501c NIR | ON Semiconductor AR0522 | 1.500 | 1.770 |
| 1800 U-507c | Sony IMX264 | 2.355 | 2.100 |
| 1800 U-507c Pol | Sony IMX264MYR | Not applicable | |
| 1800 U-508c | Sony IMX250 | 2.355 | 2.100 |
| 1800 U-508c Pol | Sony IMX250MYR | Not applicable | |
| 1800 U-510c | Sony IMX548 | 2.870 | 2.000 |
| 1800 U-511c | Sony IMX547 | 2.870 | 2.000 |
| 1800 U-811c | Sony IMX546 | 2.870 | 2.000 |

*Table 94: Alvium default values for color channels (sheet 1 of 2)*

| Alvium model | Sensor model | Red channel value | Blue channel value |
|---|---|---|---|
| 1800 U-895c | Sony IMX267 | 2.355 | 2.100 |
| 1800 U-1236c | Sony IMX304 | 2.355 | 2.100 |
| 1800 U-1240c | Sony IMX226 | 2.620 | 1.810 |
| 1800 U-1242c | Sony IMX545 | 2.870 | 2.000 |
| 1800 U-1620c | Sony IMX542 | 2.870 | 2.000 |
| 1800 U-2040c | Sony IMX541 | 2.870 | 2.000 |
| 1800 U-2050c | Sony IMX183 | 2.660 | 1.830 |
| 1800 U-2460c | Sony IMX540 | 2.870 | 2.000 |

*Table 94: Alvium default values for color channels (sheet 2 of 2)*

# Standard Alvium: Dimensions and mass

## Bare board

| Feature | USB 180° (standard orientation) | USB 90° |
|---|---|---|
| Dimensions (L × W × H) | [Model specific] × 26 mm × 26 mm | [Model specific] × 30 mm × 26 mm |
| Mass | 15 g | |

*Table 95: Standard Alvium - bare board dimensions and mass*

## Open housing 180° (standard orientation)

| Open housing | C-Mount | CS-Mount | S-Mount |
|---|---|---|---|
| Flange focal distance, optical | 17.526 mm | 12.526 mm | 12.63 mm |
| Thread | 1“-32tpi UNS-2B | 1“-32tpi UNS-2B | M12 × 0.5 mm |
| Maximum protrusion[1] | 13.6 mm | 8.6 mm | 11.0 mm |
| Body dimensions (L × W × H) in [mm] | 30 × 29 × 29 | 25 × 29 × 29 | 25 × 29 × 29 |
| Mass | 45 g | | |
| [1] For details, see Maximum protrusion for front mounts. | | | |

*Table 96: Standard Alvium - open housing 180° dimensions and mass*

## Open housing 90°

| USB 90° open housing | C-Mount | CS-Mount | S-Mount |
|---|---|---|---|
| Flange focal distance, optical | 17.526 mm | 12.526 mm | 12.63 mm |
| Thread | 1“-32tpi UNS-2B | 1“-32tpi UNS-2B | M12 × 0.5 mm |
| Maximum protrusion[1] | 13.6 mm | 8.6 mm | 11.0 mm |
| Body dimensions (L × W × H) in [mm] | 30 × 32 × 29 | 25 × 32 × 29 | 25 × 32 × 29 |
| Mass | | 50 g | |
| [1] For details, see Maximum protrusion for front mounts. | | | |

*Table 97: Standard Alvium - open housing 90° dimensions and mass*

## Closed housing 180° (standard orientation)

| Closed housing | C-Mount | CS-Mount | S-Mount |
|---|---|---|---|
| Flange focal distance, optical | 17.526 mm | 12.526 mm | 12.63 mm |
| Thread | 1“-32tpi UNS-2B | 1“-32tpi UNS-2B | M12 × 0.5 mm |
| Maximum protrusion[1] | 13.6 mm | 8.6 mm | 11.0 mm |
| Body dimensions (L × W × H) in [mm] | 38 × 29 × 29 | 33 × 29 × 29 | 33 × 29 × 29 |
| Mass[2] | | 60 g | |
| Mass[3] | | 65 g | |
| [1] For details, see Maximum protrusion for front mounts.<br>[2] Alvium 1800 U-040, -050, -120, -131, -192, -234, -235, -319, -500, -501, -507, -507 Pol<br>[3] Alvium 1800 U-030, -052, -130, -158, -203,-240, -291, -320 VSWIR, -508, -508 Pol, -510, -511,-520 VSWIR, -811, 812, -895, -1236, -1240,-1242, -1620, -2040, -2050, -2460 | | | |

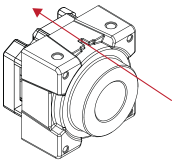
*Table 98: Standard Alvium - closed housing 180° dimensions and mass*

## Closed housing 90°

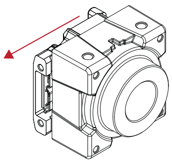
| USB 90° Closed housing | C-Mount | CS-Mount | S-Mount |
|---|---|---|---|
| Flange focal distance, optical | 17.526 mm | 12.526 mm | 12.63 mm |
| Thread | 1“-32tpi UNS-2B | 1“-32tpi UNS-2B | M12 × 0.5 mm |
| Maximum protrusion[1] | 13.6 mm | 8.6 mm | 11.0 mm |
| Body dimensions (L × W × H) in [mm] | 38 × 32 × 29 | 33 × 32 × 29 | 33 × 32 × 29 |
| Mass[2] | | 65 g | |
| Mass[3] | | 70 g | |
| [1] For details, see Maximum protrusion for front mounts.<br>[2] Alvium 1800 U-040, -050, -120, -131, -192, -234, -235, -319, -500, -501, -507, -507 Pol<br>[3] Alvium 1800 U-030, -052, -130, -158, -203,-240, -291, -320 VSWIR, -508, -508 Pol, -510, -511,-520 VSWIR, -811, 812, -895, -1236, -1240,-1242, -1620, -2040, -2050, -2460 | | | |

*Table 99: Standard Alvium - closed housing 90° dimensions and mass*

# Standard Alvium: Technical drawings



180°

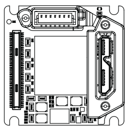
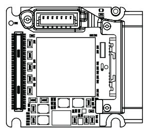


90°

**USB interface connector position**

- **180°**: The connector is at the camera backside. In the naming for camera hardware options, this option is **not mentioned**.
- **90°**: The connector is at the camera left side, as seen from the lens mount. In the naming for camera hardware options, this option is named **90°**.

Standard Alvium USB cameras are available as shown in the following table:

| **Bare Board** | |
|---|---|
| **180°** | **90°** |
|  |  |
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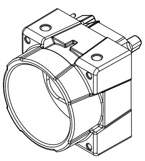
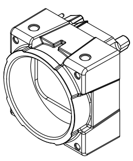
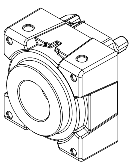
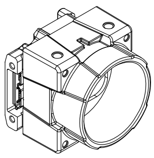
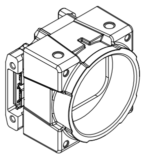
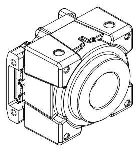
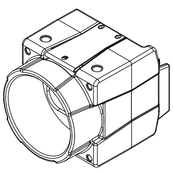
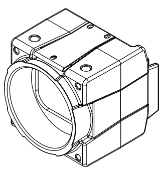
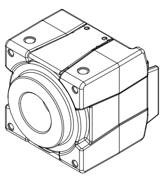
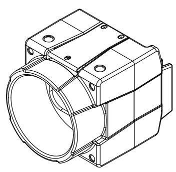
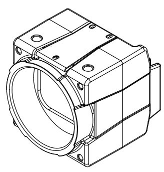
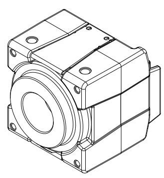
| **Open Housing** | | | | | |
|---|---|---|---|---|---|
| **180°** | | | **90°** | | |
| C-Mount | CS-Mount | S-Mount | C-Mount | CS-Mount | S-Mount |
|  |  |  |  |  |  |
| page 223 | page 224 | page 225 | page 226 | page 227 | page 228 |

| **Closed Housing** | | | | | |
|---|---|---|---|---|---|
| **180°** | | | **90°** | | |
| C-Mount | CS-Mount | S-Mount | C-Mount | CS-Mount | S-Mount |
|  |  |  |  |  |  |
| page 229 | page 230 | page 231 | page 232 | page 233 | page 234 |

# Bare Board 180° (standard Alvium)

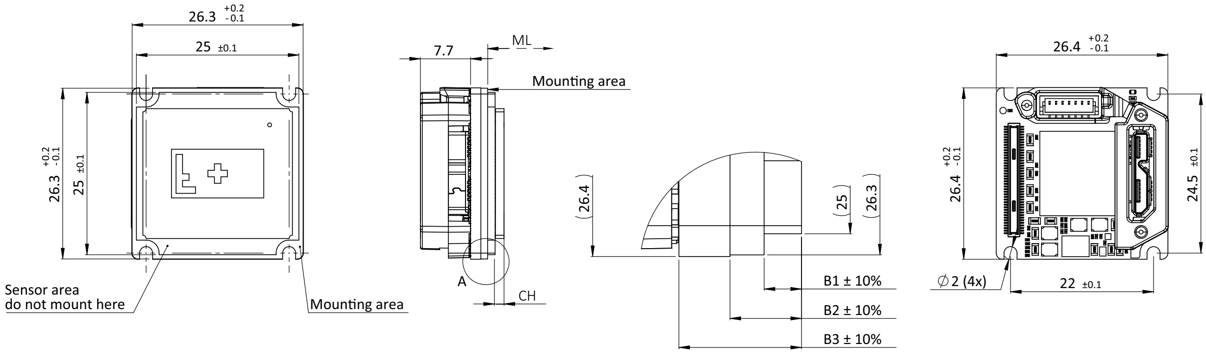



*Figure 67: Bare Board 180° (standard Alvium) dimensions*

# Bare Board 90 ° (standard Alvium)

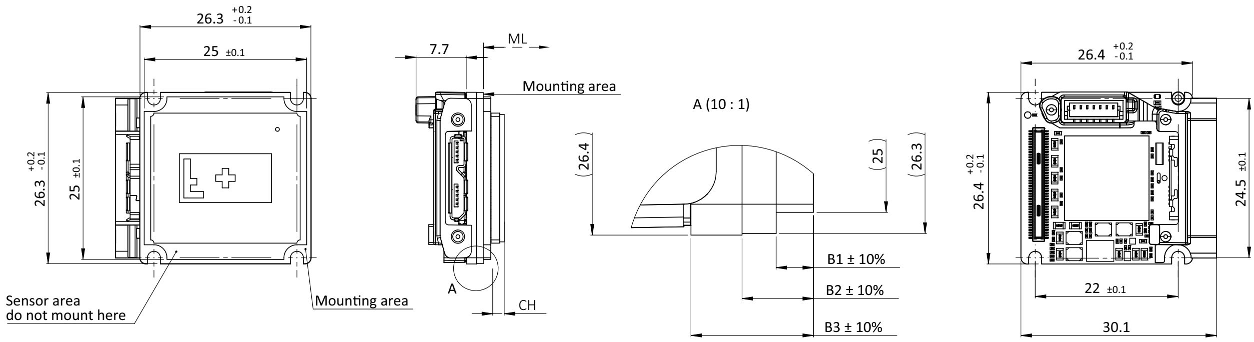



*Figure 68: Bare Board 90° (standard Alvium) dimensions*

# Values in Bare Board drawings

Dimensions that are common between different models are shown in Figure 67 for **Bare Board Standard** and in Figure 68 for **Bare Board 90°**.

Model specific dimensions are listed in Table 100. **Mechanical length** (ML) defines the mechanical distance from the mounting area to the lens mount front flange, without optical filter. **Components height** (CH) relates to the electronic components with maximum height, in some cases the sensor.

**Mechanical length for CS-Mount and S-Mount**

Mechanical length for CS-Mount and S-Mount is:

[C-Mount value] – 5 mm

| Camera model | ML: Mechanical length* for C-Mount | CH: Components height, incl. the sensor | B1: Board thickness | B2: Board thickness | B3: Board thickness |
|---|---|---|---|---|---|
| Alvium 1800 U-030 VSWIR | 19.613 mm | 2.87 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-040m/c | 19.879 mm | 2.27 mm | 1.20 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-050m/c | 19.604 mm | 1.40 mm | 1.75 mm | 3.00 mm | 4.55 mm |
| Alvium 1800 U-052m/c | 19.713 mm | 2.87 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-120m/c | 19.689 mm | 1.44 mm | 1.25 mm | 2.40 mm | 3.95 mm |
| Alvium 1800 U-130 VSWIR | 19.613 mm | 2.87 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-131m/c | 19.845 mm | 2.59 mm | 1.00 mm | 2.00 mm | 3.55 mm |
| Alvium 1800 U-158m/c | 19.879 mm | 2.27 mm | 1.20 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-192m/c | 19.845 mm | 2.59 mm | 1.00 mm | 2.00 mm | 3.55 mm |
| Alvium 1800 U-203m/c | 19.713 mm | 2.87 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-234m/c | 19.713 mm | 2.87 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-235m/c | 19.713 mm | 2.87 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-240m/c | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-291m/c | 19.713 mm | 2.87 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-319m/c | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-320 VSWIR | 19.713 mm | 2.83 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-500m/c | 19.739 mm | 1.67 mm | 1.30 mm | 2.40 mm | 3.95 mm |
| Alvium 1800 U-501m/c NIR | 19.739 mm | 1.67 mm | 1.30 mm | 2.40 mm | 3.95 mm |
| Alvium 1800 U-507m/c | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-507m/c Pol | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-508m/c | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-508m/c Pol | 19.929 mm | 2.27 mm | 1.25 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-510m/c | 19.713mm | 2.20 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-511m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-530 VSWIR | 19.713 mm | 2.83 mm | 1.10 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-811m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-812 UV | 19.610 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-895m/c | 19.829 mm | 2.27 mm | 1.15 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-1236m/c | 19.829 mm | 2.27 mm | 1.15 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-1240m/c | 19.763 mm | 2.20 mm | 1.15 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-1242m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-1620m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-2040m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-2050m/c | 19.663 mm | 2.87 mm | 1.05 mm | 2.20 mm | 3.75 mm |
| Alvium 1800 U-2460m/c | 19.613 mm | 2.88 mm | 1.00 mm | 2.20 mm | 3.75 mm |
| * Theoretical values | | | | | |

*Table 100: Bare Board and Bare Board 90° (standard Alvium and Alvium Flex) model specific dimensions and nominal values*

# Open Housing C-Mount 180° (standard Alvium)

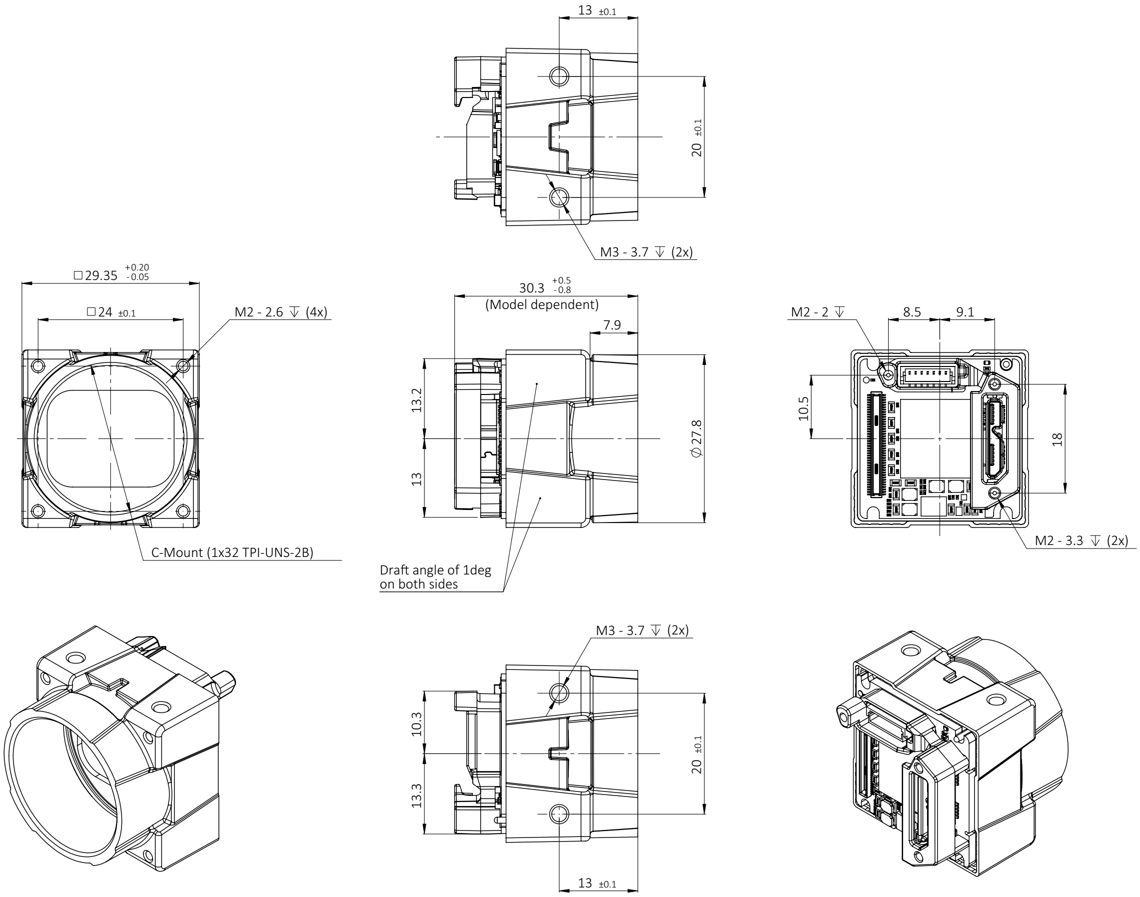



*Figure 69: Open Housing C-Mount 180° (standard Alvium) dimensions*

# Open Housing CS-Mount 180° (standard Alvium)

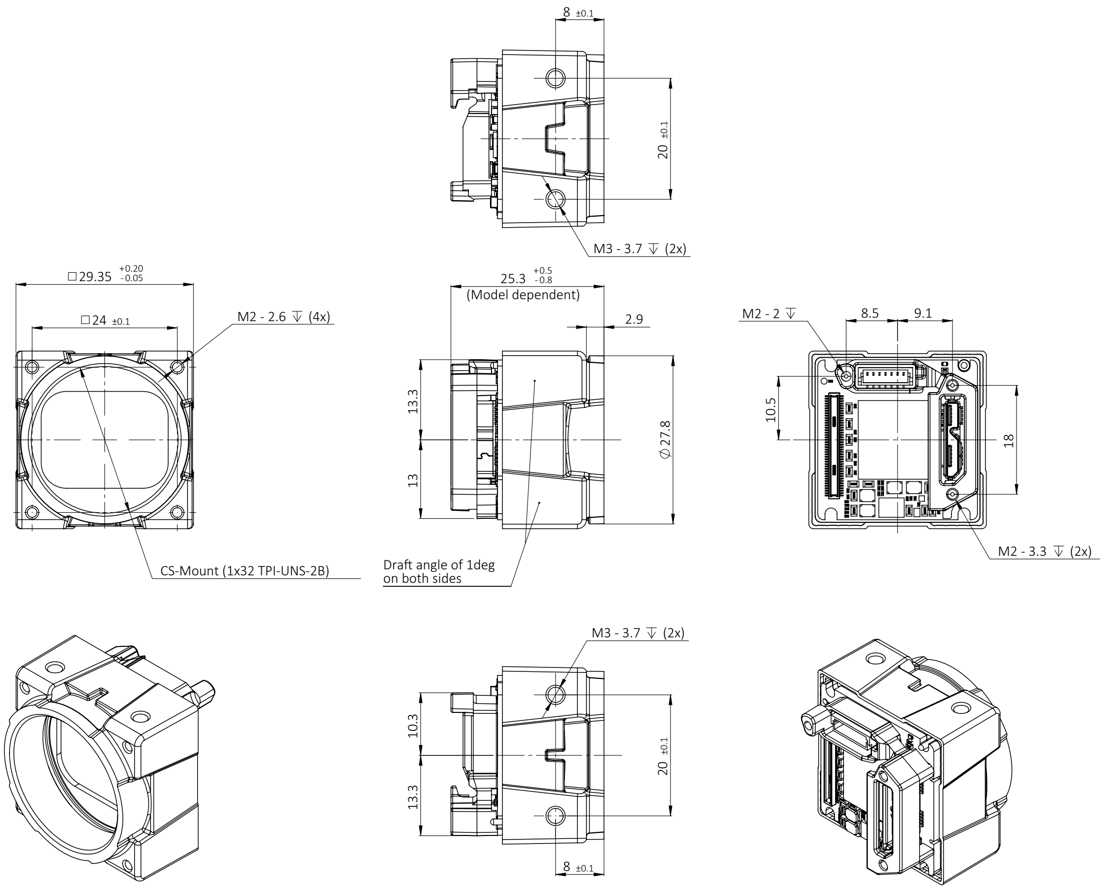



*Figure 70: Open Housing CS-Mount 180° (standard Alvium) dimensions*

# Open Housing S-Mount 180° (standard Alvium)

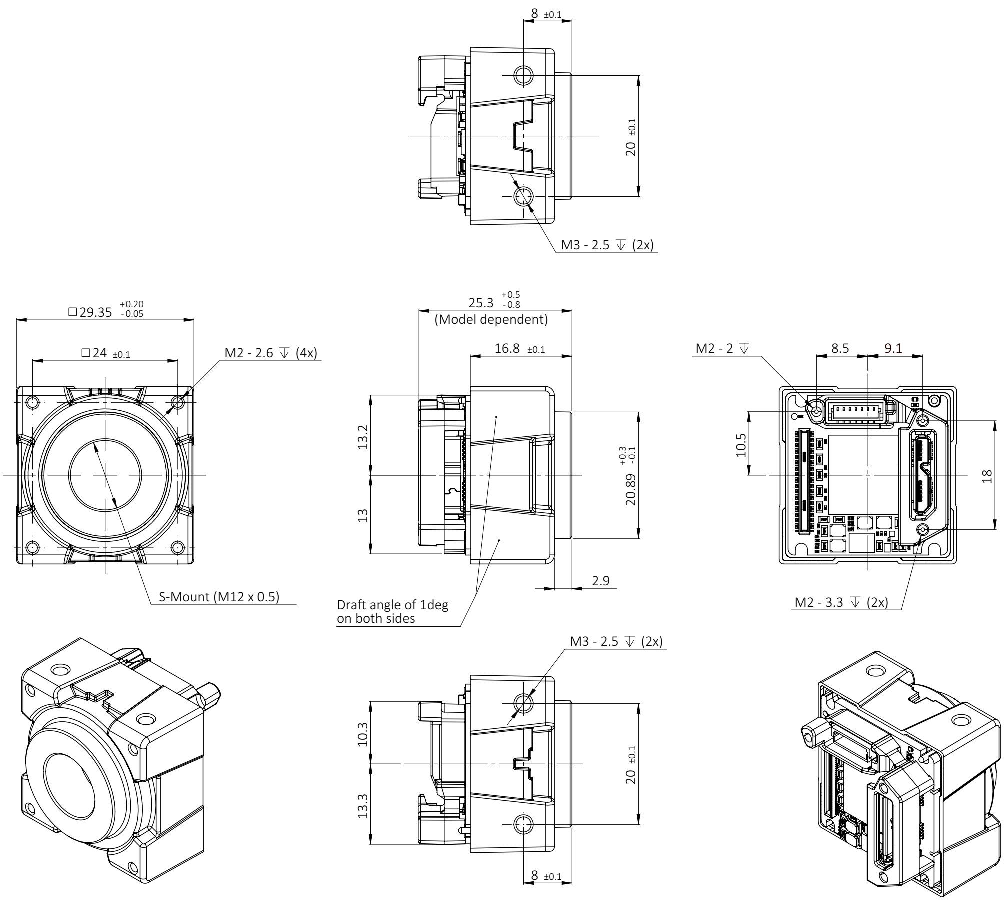



*Figure 71: Open Housing S-Mount 180° (standard Alvium) dimensions*

# Open Housing C-Mount 90° (standard Alvium)

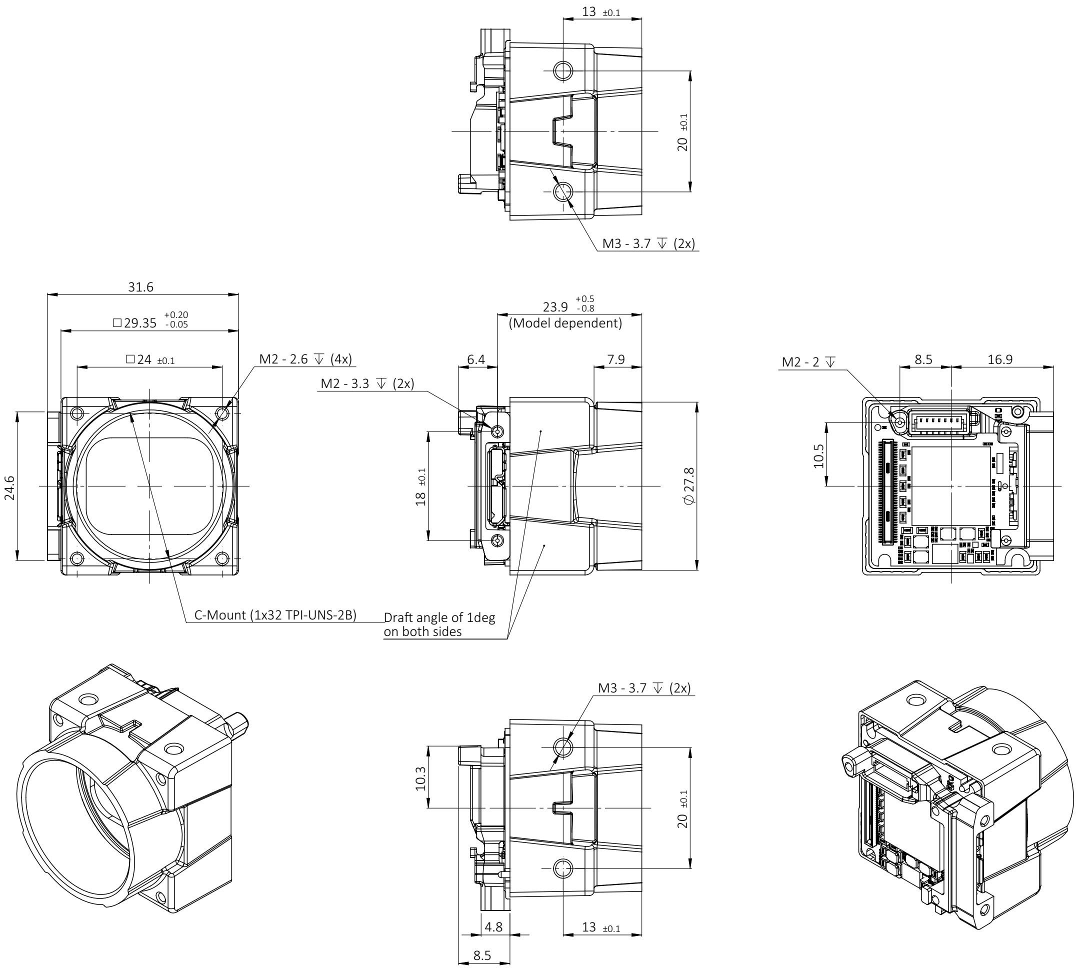



*Figure 72: Open Housing C-Mount 90° (standard Alvium) dimensions*

# Open Housing CS-Mount 90° (standard Alvium)

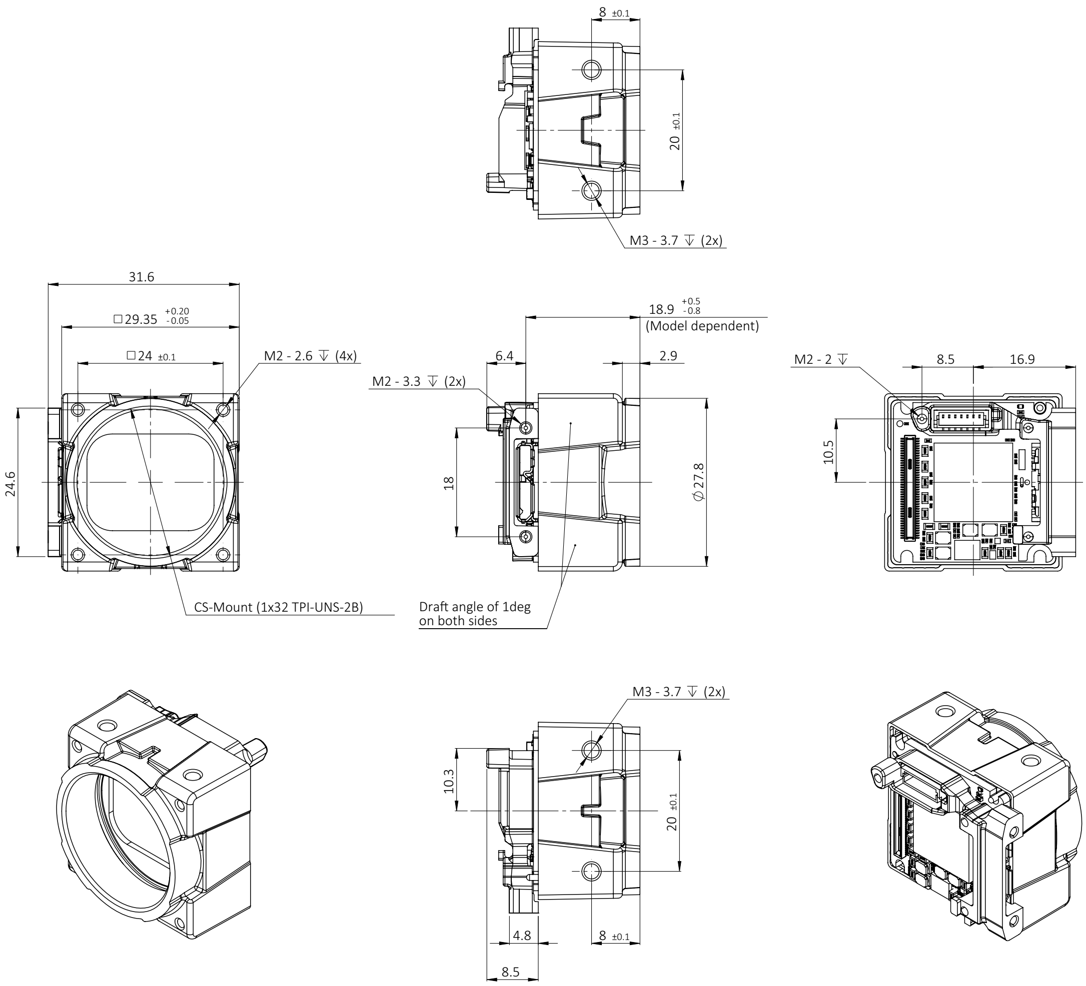



*Figure 73: Open Housing CS-Mount 90° (standard Alvium) dimensions*

# Open Housing S-Mount 90° (standard Alvium)

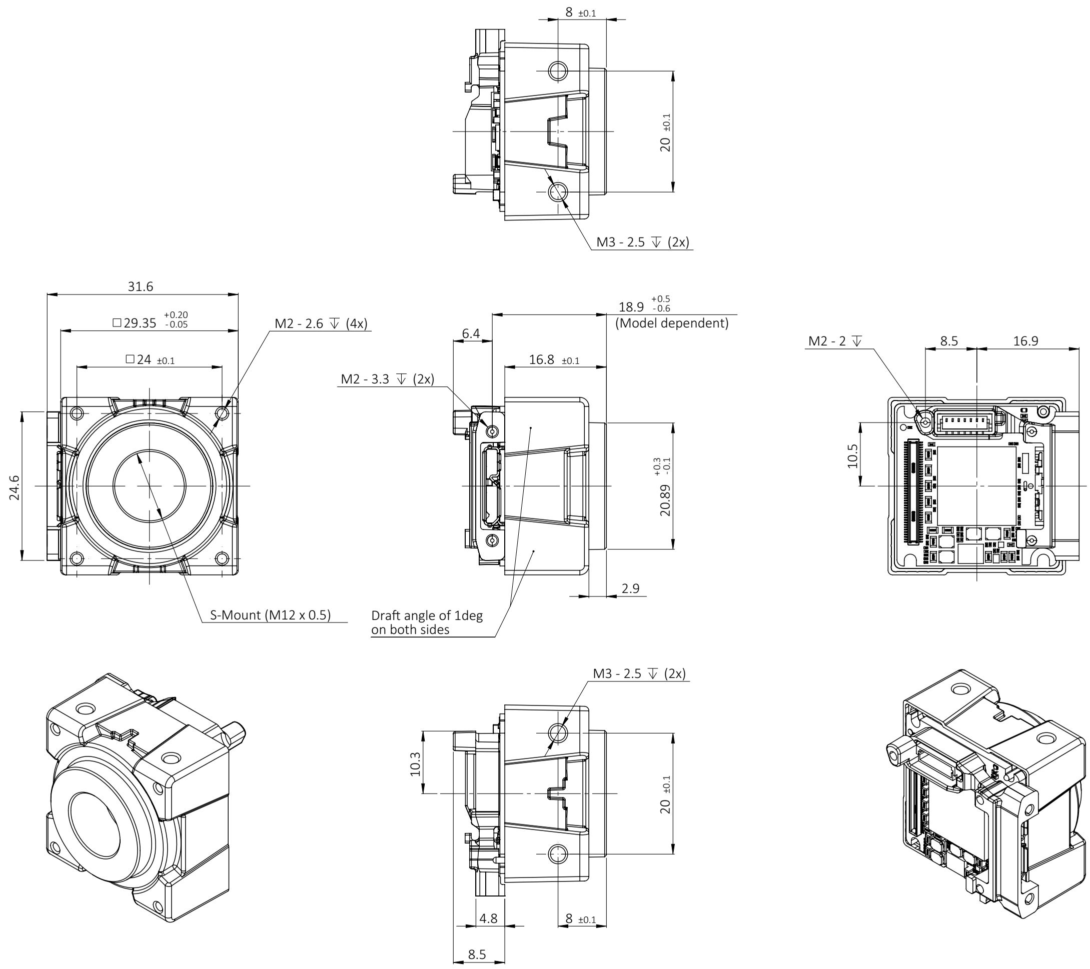



*Figure 74: Open Housing S-Mount 90° (standard Alvium) dimensions*

# Closed Housing C-Mount 180° (standard Alvium)

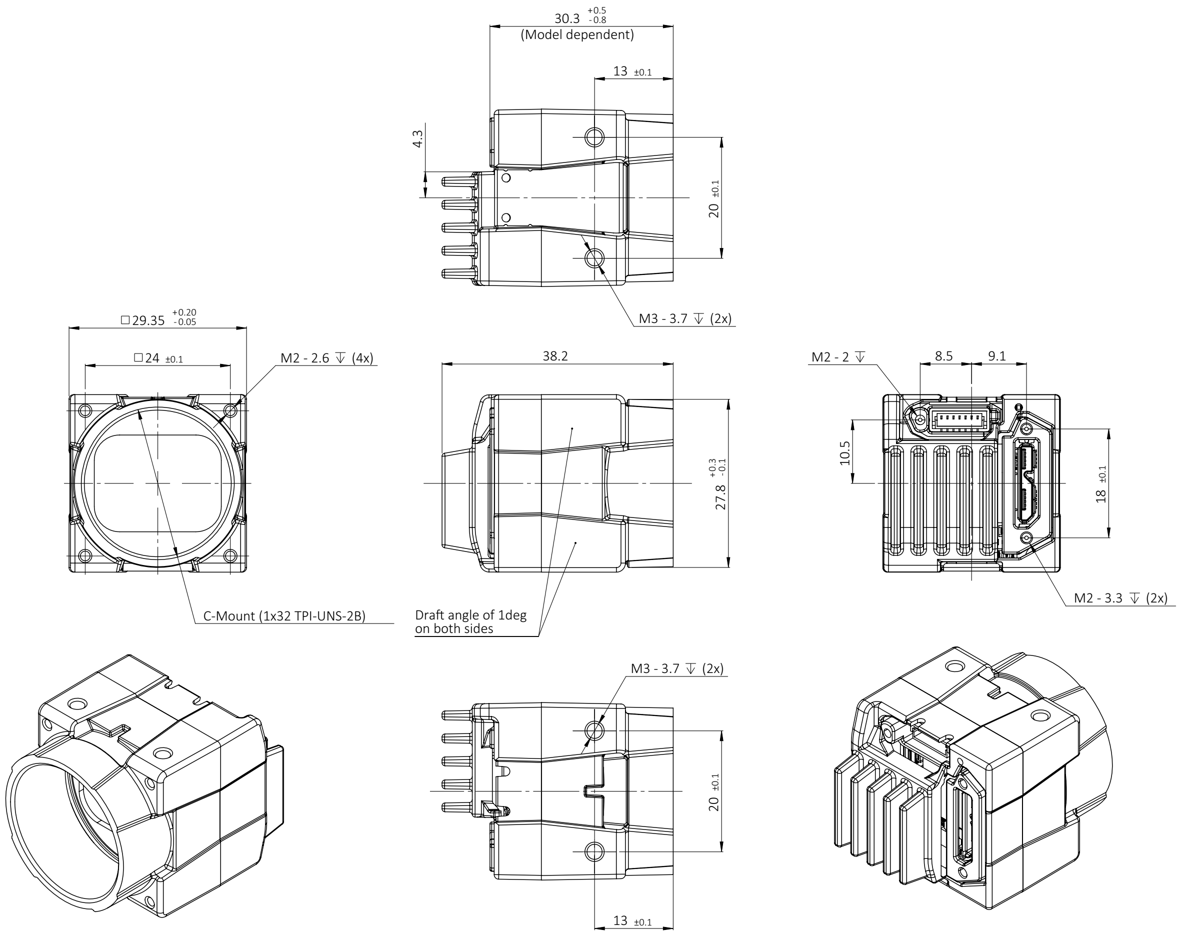



*Figure 75: Closed Housing C-Mount 180° (standard Alvium) dimensions*

# Closed Housing CS-Mount 180° (standard Alvium)

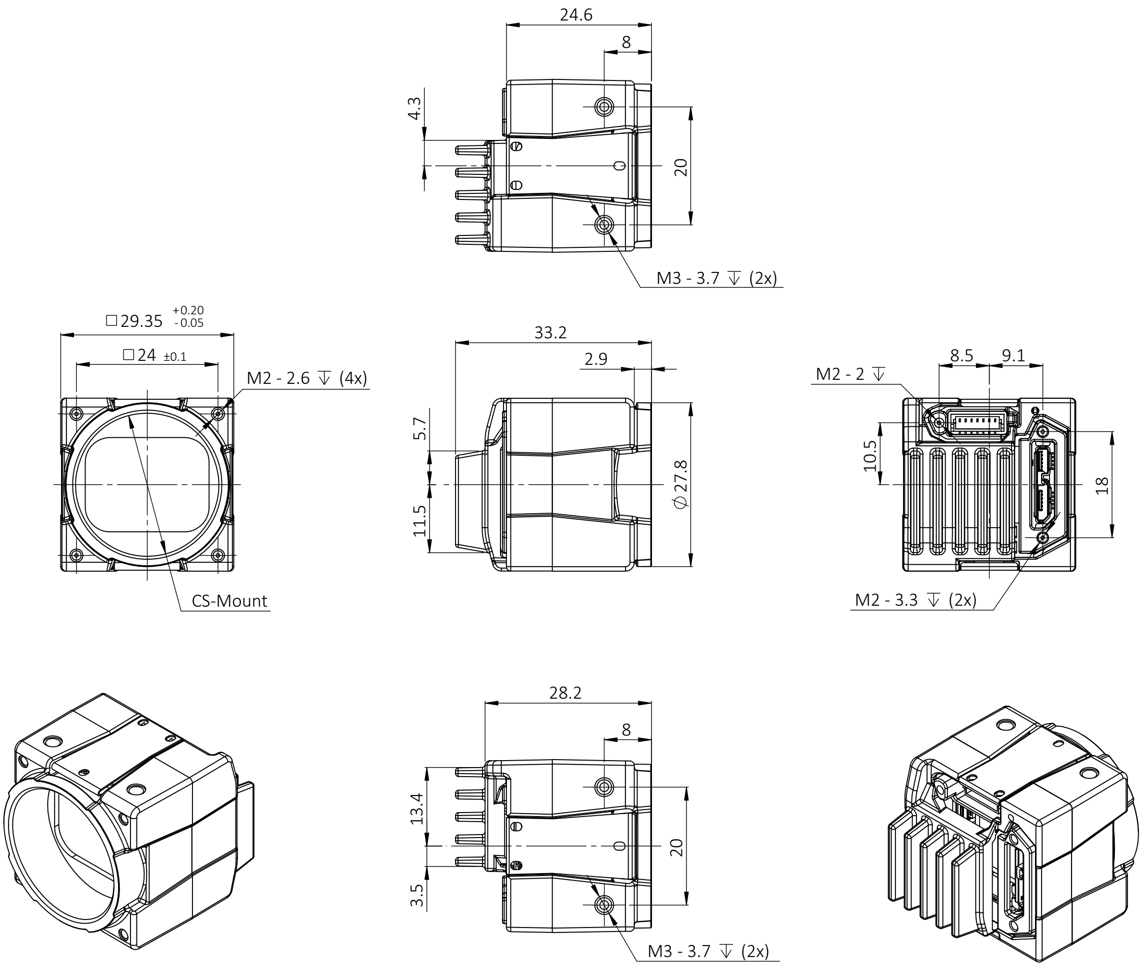



*Figure 76: Closed Housing CS-Mount 180° (standard Alvium) dimensions*

# Closed Housing S-Mount 180° (standard Alvium)

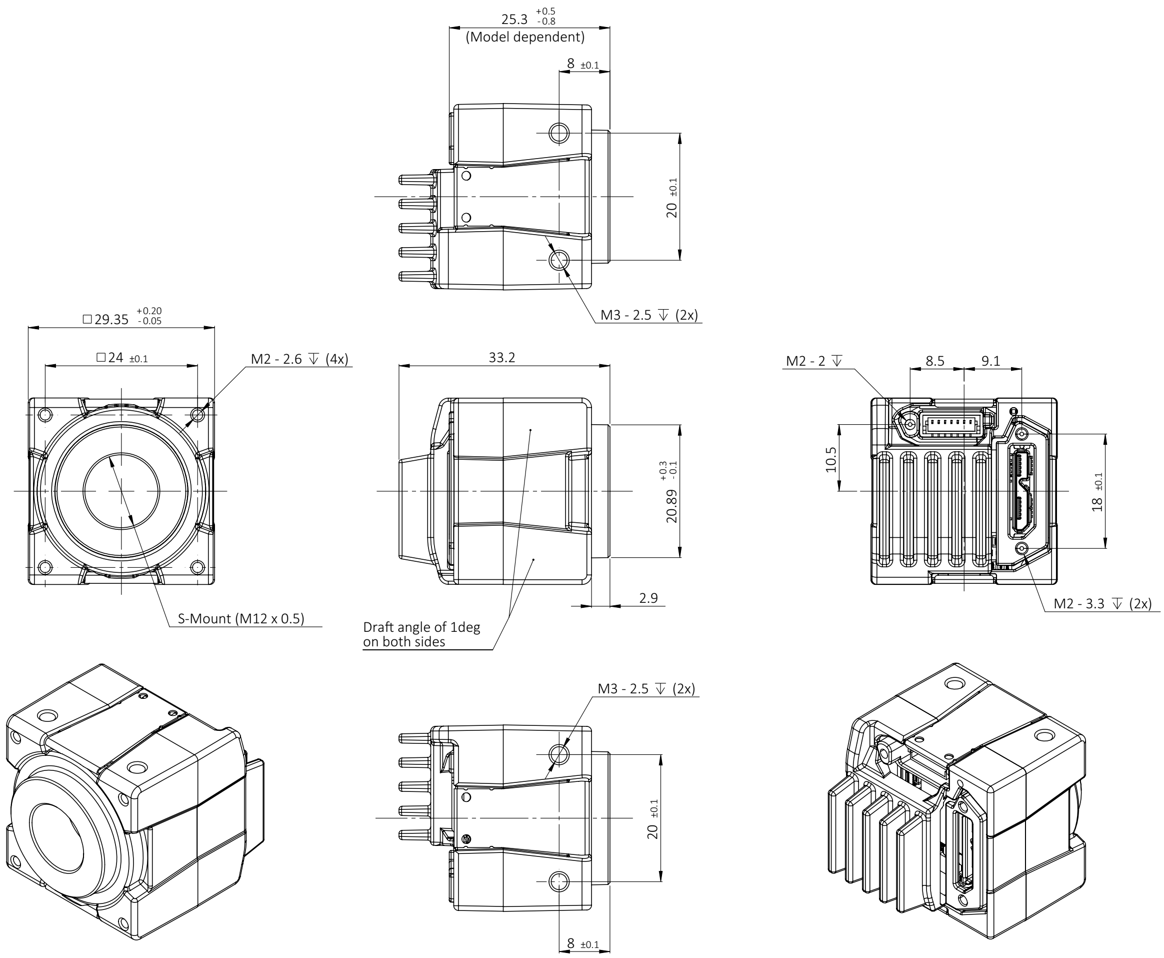



*Figure 77: Closed Housing S-Mount 180° (standard Alvium) dimensions*

# Closed Housing C-Mount 90° (standard Alvium)

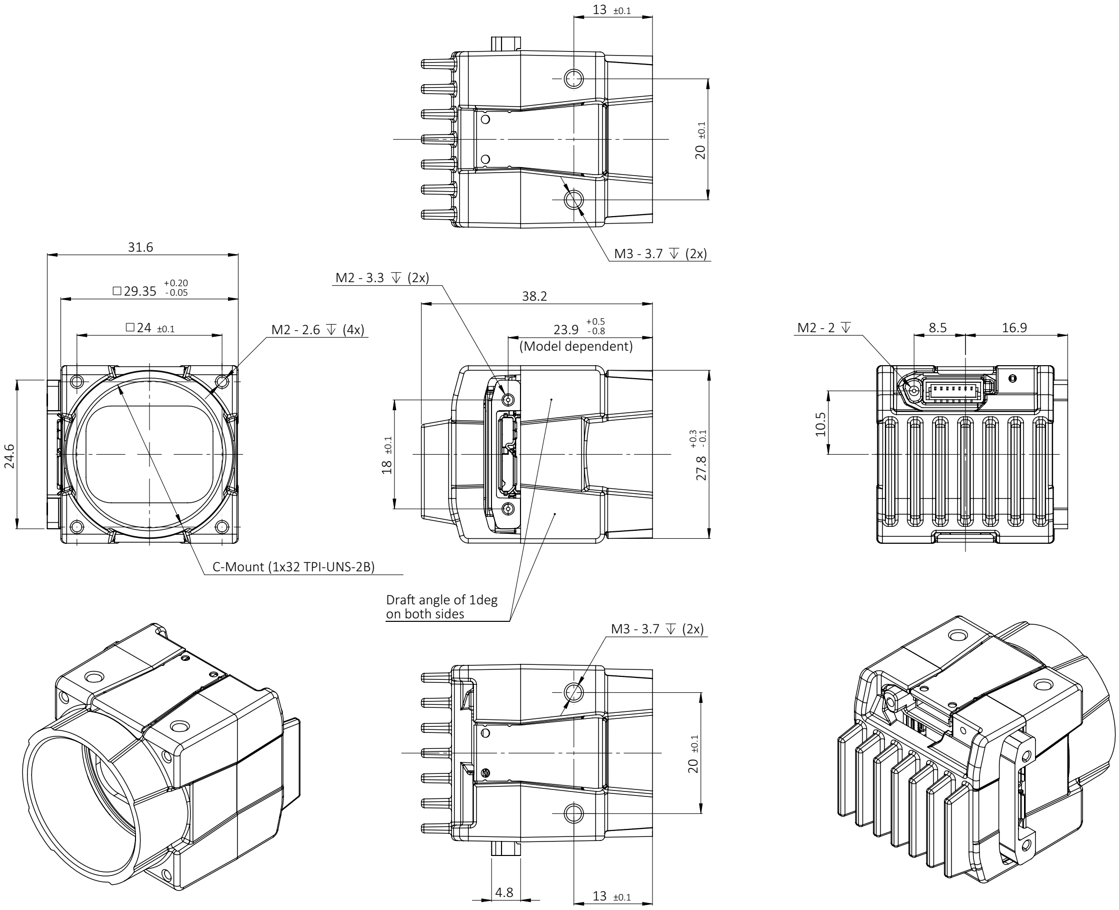



*Figure 78: Closed Housing C-Mount 90° (standard Alvium) dimensions*

# Closed Housing CS-Mount 90° (standard Alvium)

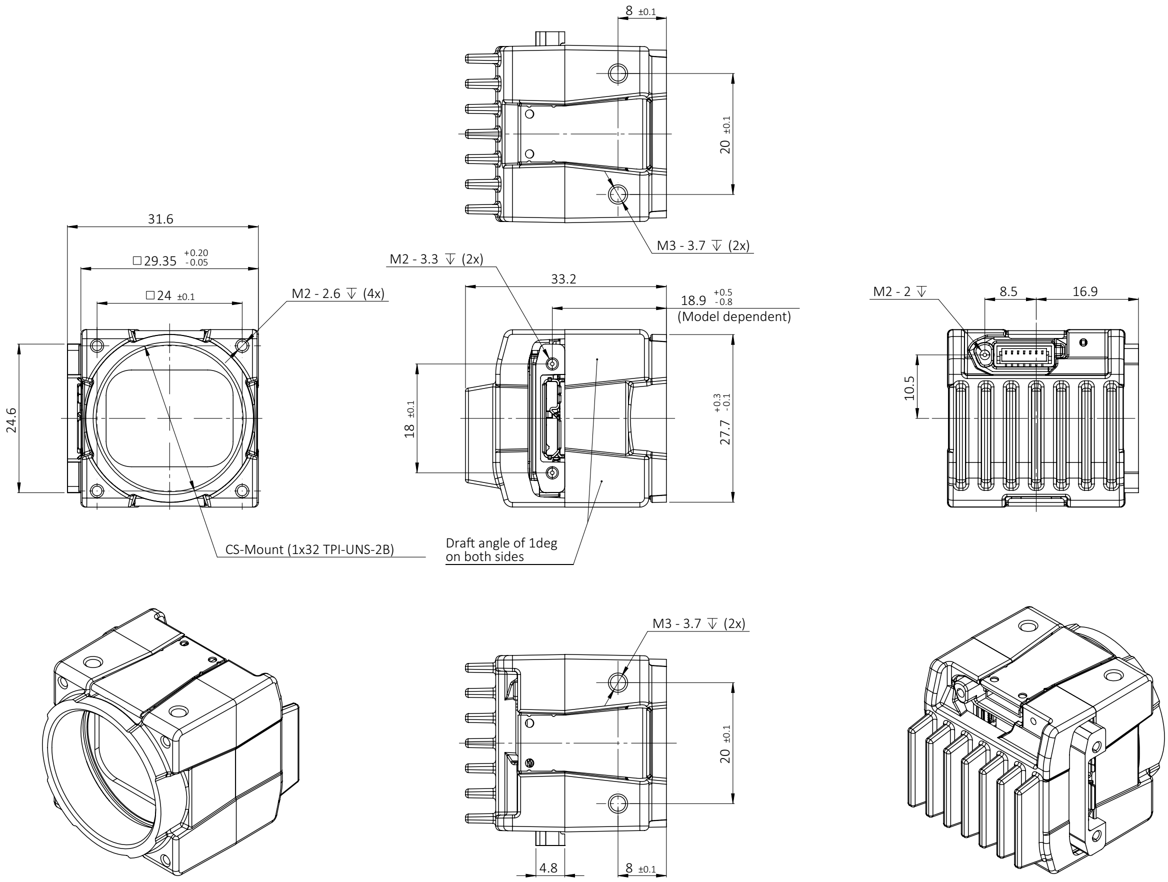



*Figure 79: Closed Housing CS-Mount 90° (standard Alvium) dimensions*

# Closed Housing S-Mount 90° (standard Alvium)

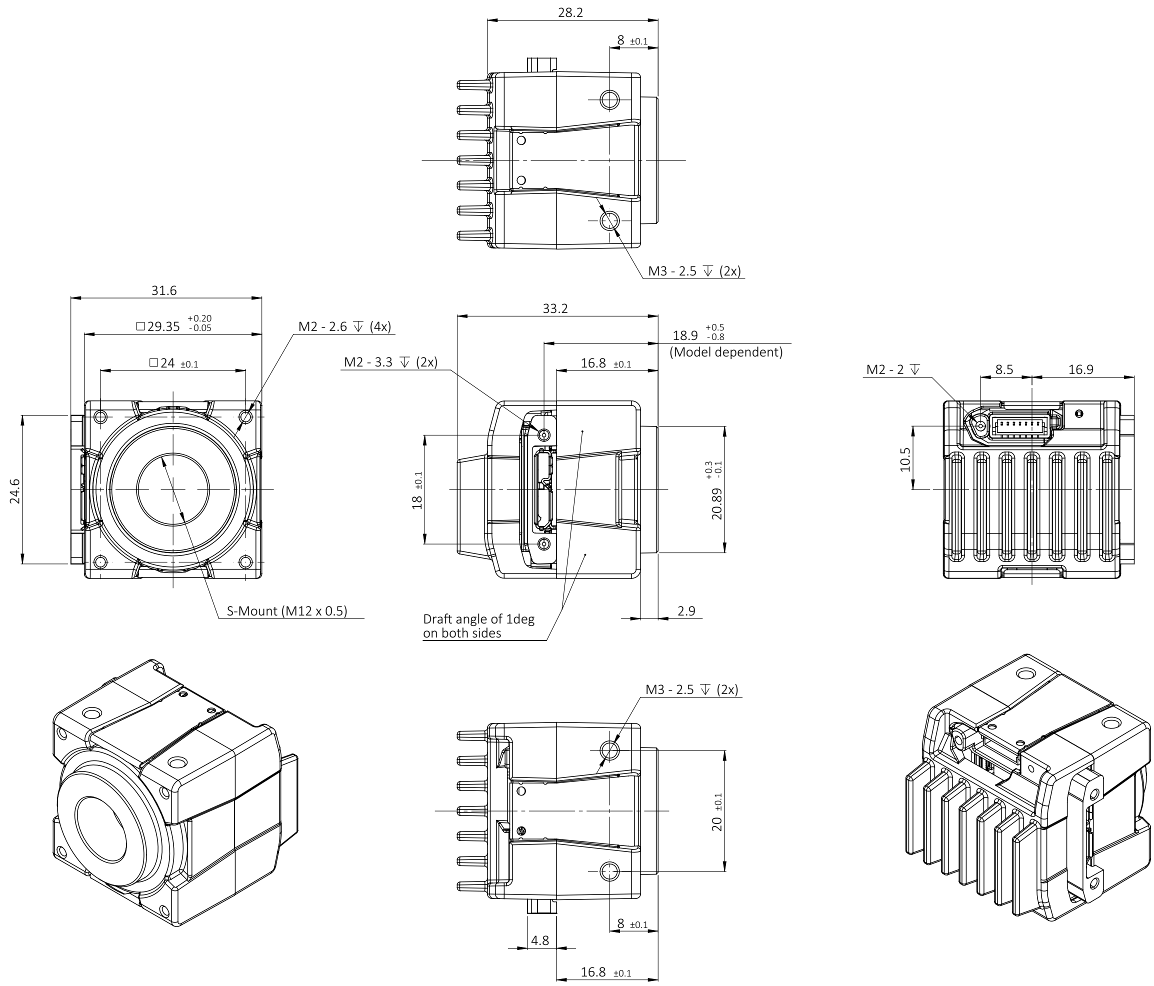



*Figure 80: Closed Housing S-Mount 90° (standard Alvium) dimensions*

# Alvium Flex: Dimensions and mass

## Bare board

| Feature | Specification |
|---|---|
| Dimensions (L × W × H) | [Model specific] × 26 mm × 26 mm |
| Mass | 10 g |

*Table 101: Alvium Flex - bare board dimensions and mass*

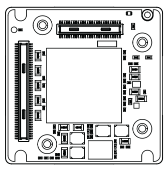
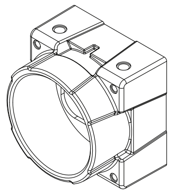
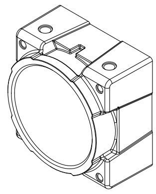
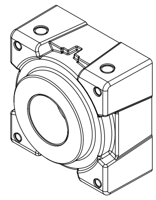
## Open housing

| Open housing | C-Mount | CS-Mount | S-Mount |
|---|---|---|---|
| Flange focal distance, optical | 17.526 mm | 12.526 mm | 12.63 mm |
| Thread | 1“-32tpi UNS-2B | 1“-32tpi UNS-2B | M12 × 0.5 mm |
| Maximum protrusion[1] | 13.6 mm | 8.6 mm | 11.0 mm |
| Body dimensions (L × W × H) in [mm] | 25 × 29 × 29 | 20 × 29 × 29 | 20 × 29 × 29 |
| Mass | 40 g | | |
| [1] For details, see Maximum protrusion for front mounts. | | | |

*Table 102: Alvium Flex - open housing dimensions and mass*

# Alvium Flex: Technical drawings

Alvium USB Flex cameras are available with the following housing options:

| | | | | |
|---|---|---|---|---|
| |  |  |  |  |
| **Option** | Bare Board | Open Housing C-Mount | Open Housing CS-Mount | Open Housing S-Mount |
| **Page** | 236 | 237 | 238 | 239 |

## Bare Board (Alvium Flex)

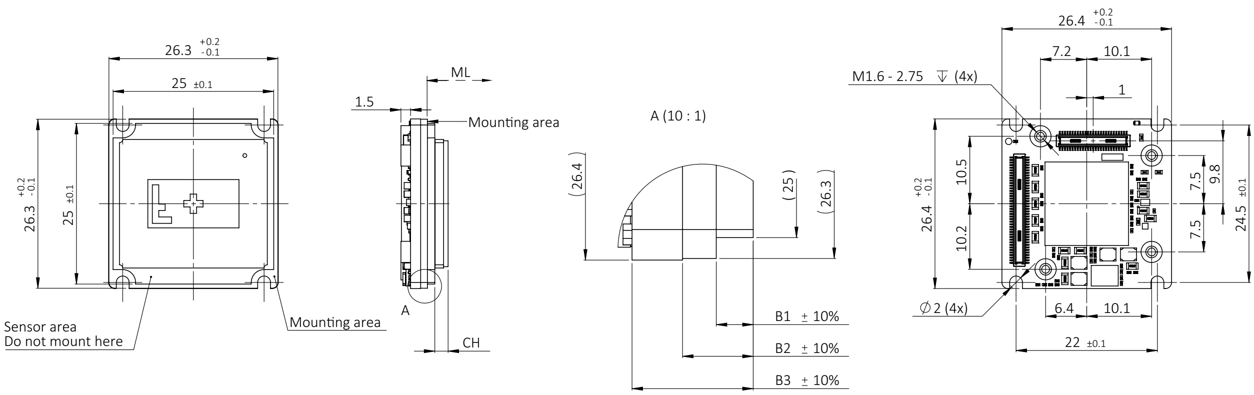



*Figure 81: Bare Board (Alvium Flex) dimensions*

Dimensions that are common between different models are shown in Figure 81. Model specific dimensions are listed in Table 100. **Mechanical length** (ML) defines the mechanical distance from the mounting area to the lens mount front flange, without optical filter. **Components height** (CH) relates to the electronic components with maximum height, in some cases the sensor.

# Open Housing C-Mount (Alvium Flex)

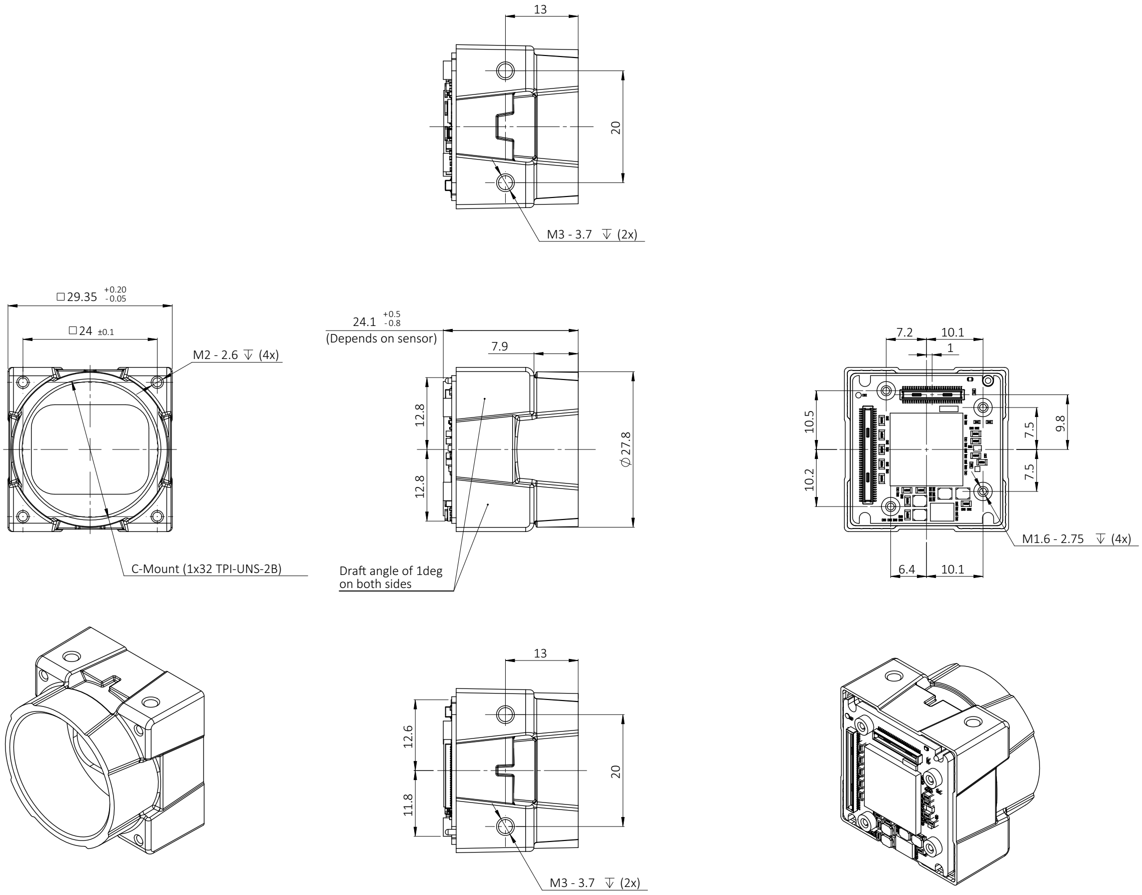



*Figure 82: Open Housing C-Mount (Alvium Flex) dimensions*

# Open Housing CS-Mount (Alvium Flex)

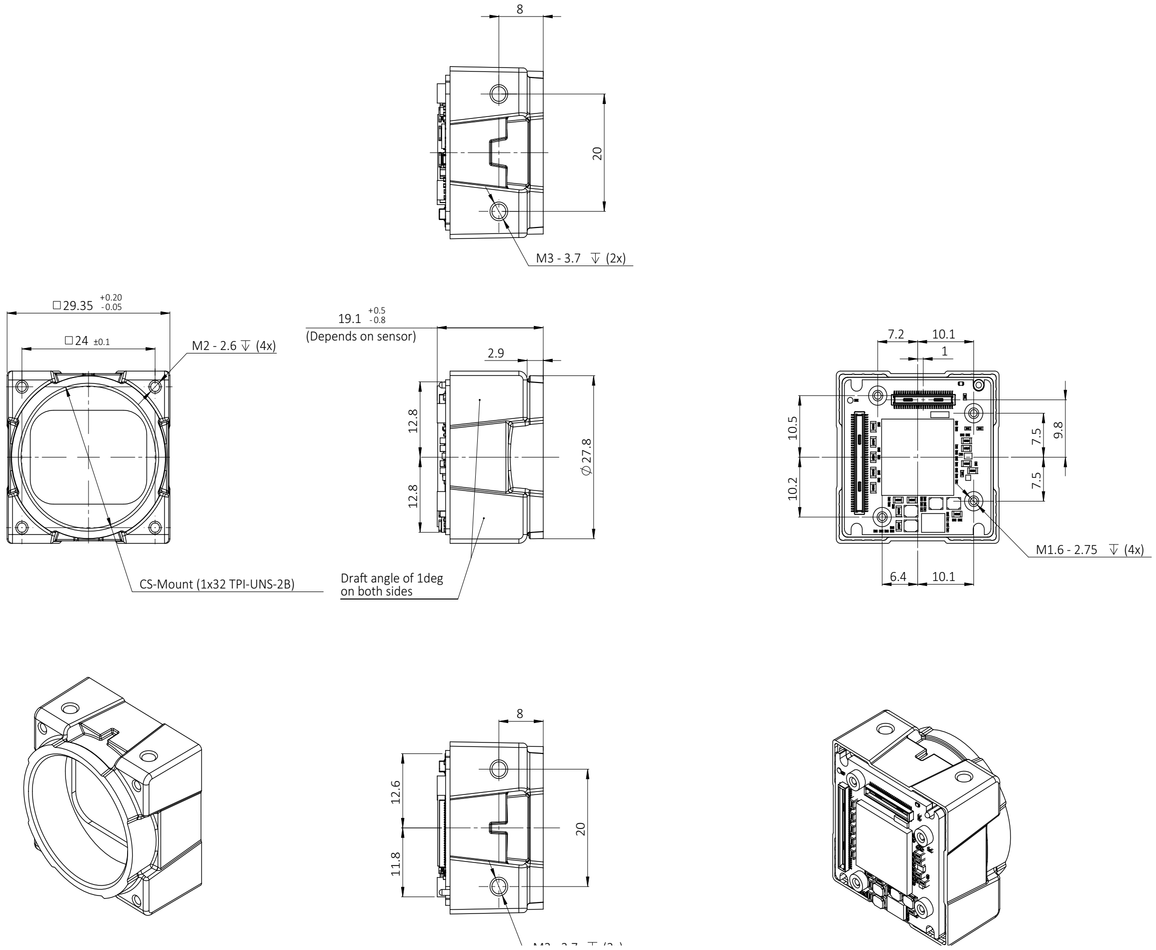



*Figure 83: Open Housing CS-Mount (Alvium Flex) dimensions*

# Open Housing S-Mount (Alvium Flex)

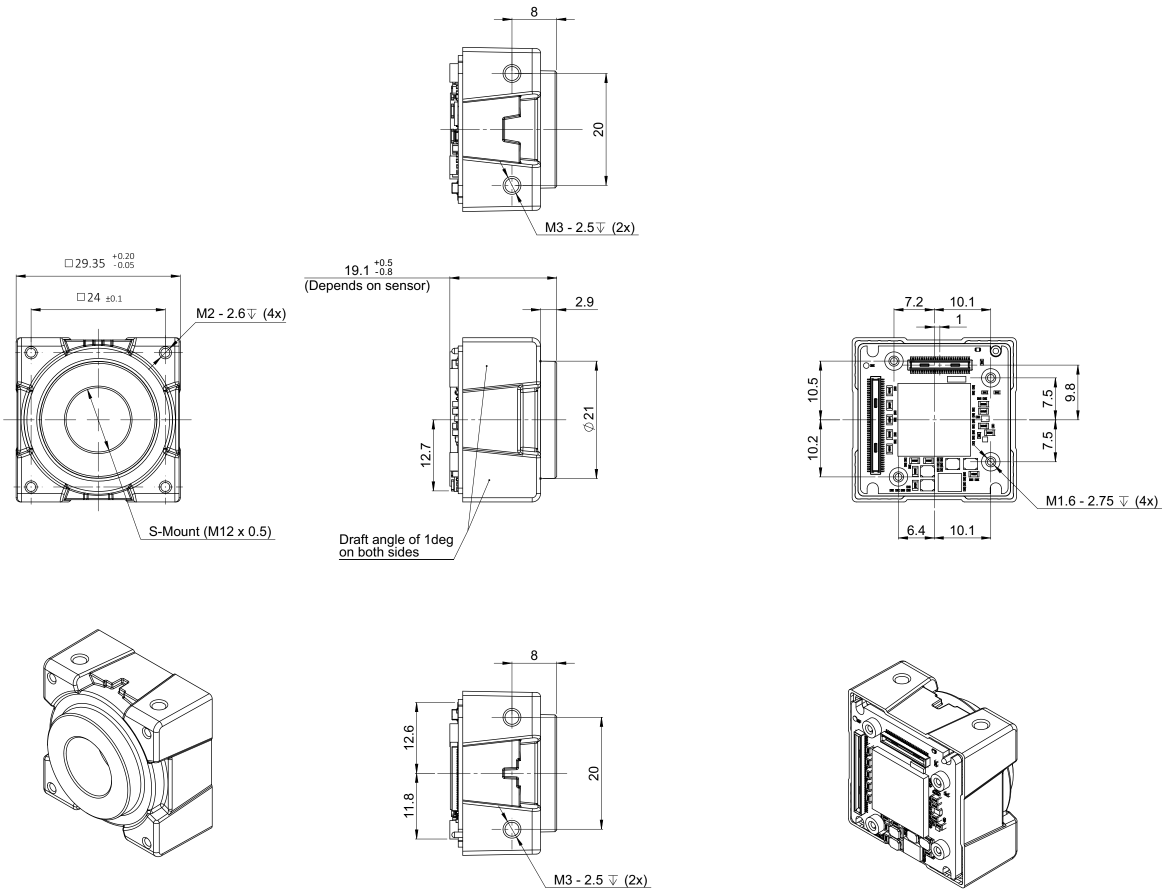



*Figure 84: Open Housing S-Mount (Alvium Flex) dimensions*

# Alvium Frame: Dimensions and mass

| Frame cameras | Frame 180° | Frame 90° |
|---|---|---|
| Flange focal distance, optical | 3.576 mm | |
| Front hole diameter | 24.5 mm | |
| Maximum protrusion | 1.5 mm | |
| Body dimensions (L × W × H) | 16.3 mm × 29 mm × 29 mm | 16.3 mm × 31.4 mm × 29 mm |
| Mass | 20 g | 25 g |

*Table 103: Housing dimensions and mass (Alvium Frame)*

# Alvium Frame: Technical drawings

## Alvium Frame 180°

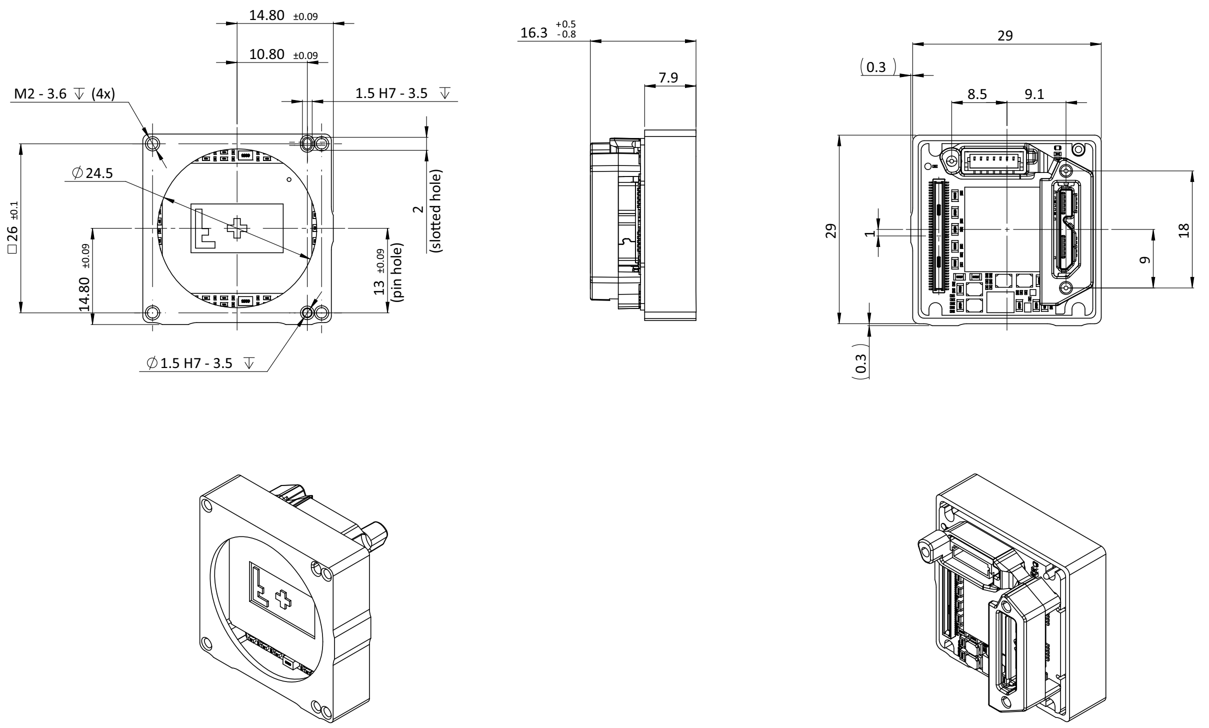



*Figure 85: Alvium Frame 180° dimensions*

## Alvium Frame 90°

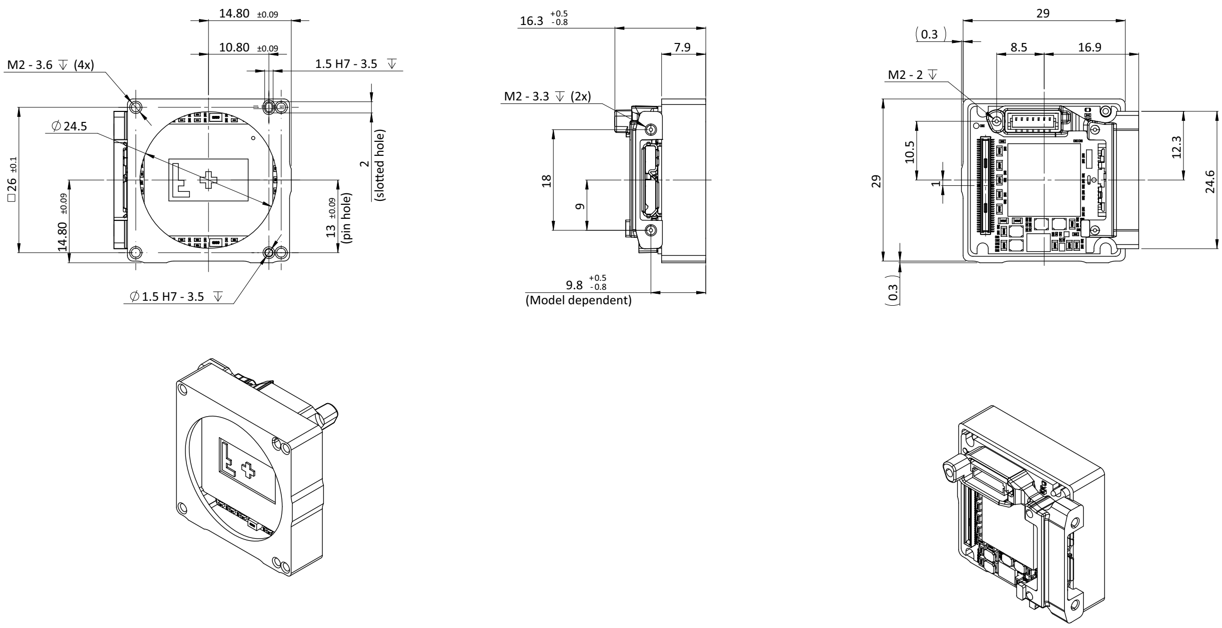



*Figure 86: Alvium Frame 90° dimensions*

# Alvium Frame Flex: Dimensions and mass

| Frame cameras | Frame Flex |
|---|---|
| Flange focal distance, optical | 3.576 mm |
| Front hole diameter | 24.5 mm |
| Maximum protrusion[1] | 1.5 mm |
| Body dimensions (L × W × H) | 10.1 mm × 29 mm × 29 mm |
| Mass | 15 g |

*Table 104: Housing dimensions and mass (Alvium Frame Flex)*

# Alvium Frame Flex: Technical drawings

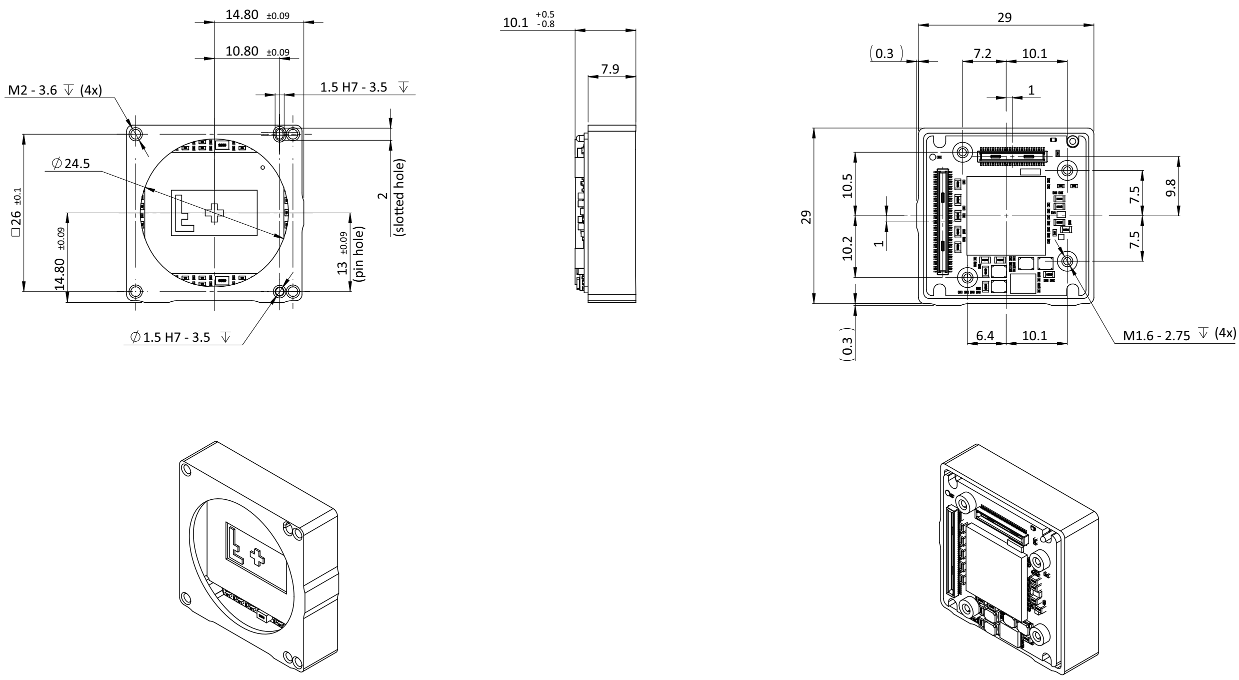



*Figure 87: Alvium Frame Flex dimension*

# Maximum protrusion for front mounts

**No need to readjust lens mounts**

Alvium USB camera mounts are adjusted with high precision during manufacturing. Construction ensures permanent accuracy without need to readjust.

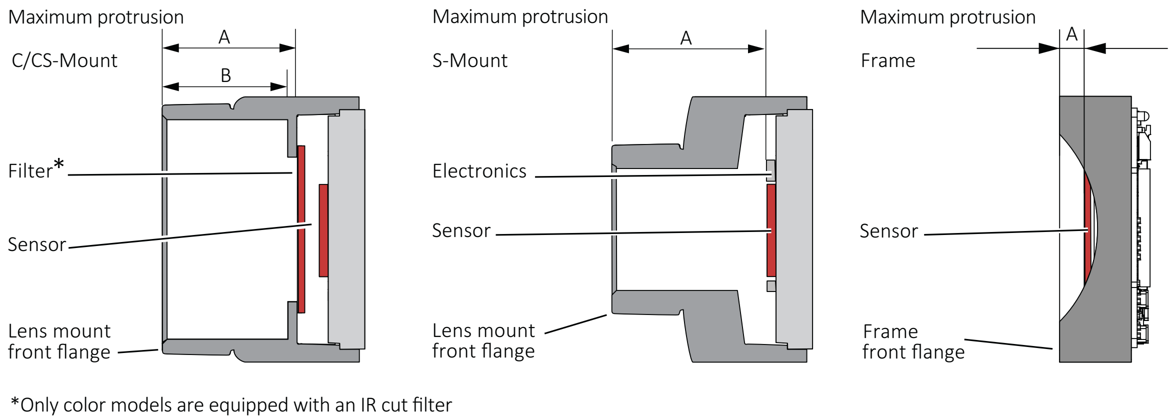



*Figure 88: Maximum protrusion CS-Mount and C-Mount, S-Mount, Frame*

Figure 88 shows schematics for maximum protrusion of objects (typically lenses), Table 105 shows values for maximum protrusion.

**NOTICE**

**Damage to sensor, optics, or electronics by unsuitable lenses or objects**

The sensor, filter, lens, or camera electronics can be damaged if an object (typically a lens) exceeding maximum protrusion is mounted to the camera.

- Use lenses with less than the allowed maximum protrusion, see Table 105.
- Mount objects with less than the allowed maximum protrusion, see Table 105.
- See Mounting the lens on page 279.
- For S-Mount lenses, see Mounting and focusing S-Mount lenses on page 280.

| Mount | Maximum protrusion |
|---|---|
| C-Mount | 13.6 mm |
| CS-Mount | 8.6 mm |
| S-Mount | 11.0 mm |
| Frame | 1.5 mm |

*Table 105: Alvium USB cameras maximum protrusion*

# IR cut filter

Table 106 shows which Alvium models are equipped with an IR cut filter. The filter is permanently installed and cannot be removed.

| Color or monochrome model | C-Mount | CS-Mount | S-Mount | Bare Board | Frame |
|---|---|---|---|---|---|
| Color | Type IRC 625 colored glass IR cut filter | | No filter | | |
| Monochrome and VSWIR | No filter | | | | |

*Table 106: Optical filter availability*

Cameras **without** IR cut filter have a higher sensitivity for low-light imaging. Moreover, spectral sensitivity is increased.

Cameras **with** IR cut filter are more accurate in reproduction of color, contrast, and sharpness, as the filter absorbs near-IR wavelengths. See Figure 89 for filter transmission.

**Spectral transmission values**

The following curve shows typical transmission for type IRC 625 colored glass IR cut filter. Values may vary slightly by filter lot.

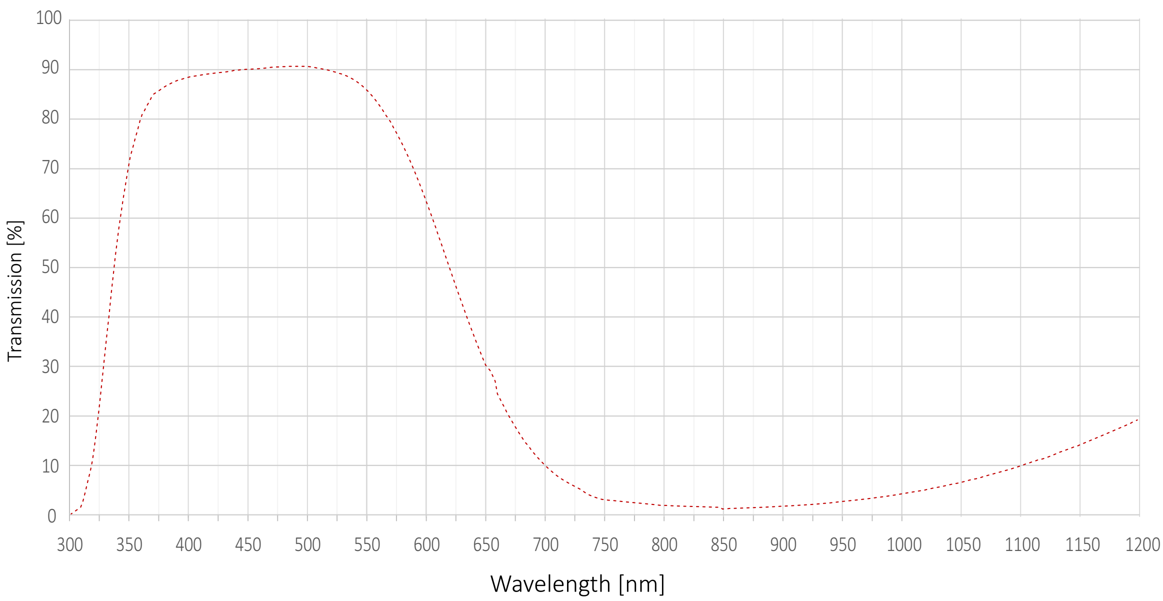



*Figure 89: Type IRC 625 colored glass filter spectral transmission (exemplary curve)*

**S-Mount lenses with IR cut design**

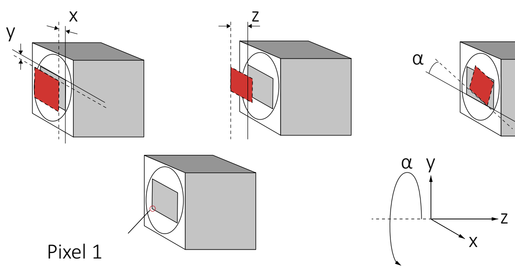
For improved image quality, we recommend using S-Mount lenses that are IR- optimized or that have IR cut coating. See the S-Mount Lenses User Guide at www.alliedvision.com/fileadmin/content/documents/products/accessories/lenses/Allied_Vision/Data Sheet/S-Mount-Lenses_User-Guide.pdf.

# Sensor position accuracy

**Sensor alignment for bare board cameras**

The sensors in Alvium bare board cameras are not aligned to a lens mount. You must align these cameras into housings individually, which can be difficult and expensive. As a possible solution, Alvium Frame cameras provide alignment areas and holes to fit into individual housings, see Alvium Frame- use your own optical mount on page 19.

## Housed standard and Flex cameras: 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 90: Sensor shift and rotation*

The following table defines the manufacturing accuracy for sensor positioning with housed standard and Flex cameras.

| 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 to -100 µm (optical back focal length) |
| | $\alpha$[1] | ±0.5 deg (sensor rotation as the deviation from the parallel to the camera bottom) |

[1] We cannot measure or guarantee these values for S-Mount hardware options that are manufactured on customer request for: Alvium 1800 U-052, -203, -234, -235, -291, -320 VSWIR, -507, -507 Pol, -508, -508 Pol, -511, -530 VSWIR, -811, -812 UV, -895, -1236, -1242, -1620, -2040, -2050, -2460.

*Table 107: Alvium USB cameras, criteria of sensor position accuracy*

**Values for Alvium Frame cameras**

For sensor shift and rotation with Alvium Frame cameras, see Housed Alvium Frame: Sensor shift and rotation on page 246. For sensor tilt, see Housed Alvium USB cameras: Sensor tilt on page 246.

# Housed Alvium Frame: Sensor shift and rotation

The following table defines the manufacturing accuracy for sensor positioning with housed Alvium Frame cameras. For sensor tilt, see Housed Alvium USB cameras: Sensor tilt on page 246.

| 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 | ±90 µm (sensor shift) |
| | z | 0 to -50 µm (optical back focal length) |
| | $\alpha^1$ | ±0.5 deg (sensor rotation as the deviation from the parallel to the camera bottom) |

*Table 108: Alvium USB Frame cameras, sensor shift and rotation*

# Housed Alvium USB cameras: Sensor tilt

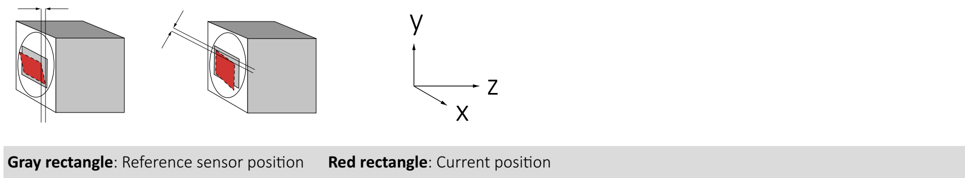



*Figure 91: Sensor tilt*

The following table defines sensor tilt as the variance between highest and lowest pixel of a sensor along the z-axis, measured in micrometers for housed Alvium USB cameras.

| Alvium USB model | Pixel size | Maximum tilt |
|---|---|---|
| Alvium 1800 U-030 VSWIR | 5 µm × 5 µm | 50 µm |
| Alvium 1800 U-040m/c | 6.9 µm × 6.9 µm | 95 µm |

*Table 109: Sensor tilt (sheet 1 of 2)*

| Alvium USB model | Pixel size | Maximum tilt |
|---|---|---|
| Alvium 1800 U-050m/c | 4.8 µm × 4.8 µm | 47 µm |
| Alvium 1800 U-052m/c | 9.0 µm × 9.0 µm | 36 µm |
| Alvium 1800 U-120m/c | 3.75 µm × 3.75 µm | 29 µm |
| Alvium 1800 U-130 VSWIR | 5 µm × 5 µm | 50 µm |
| Alvium 1800 U-131m/c | 5.3 µm × 5.3 µm | 57 µm |
| Alvium 1800 U-158m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-192m/c | 4.5 µm × 4.5 µm | 41 µm |
| Alvium 1800 U-203m/c | 4.5 µm × 4.5 µm | 41 µm |
| Alvium 1800 U-234m/c | 5.86 µm × 5.86 µm | 69 µm |
| Alvium 1800 U-235m/c | 5.86 µm × 5.86 µm | 69 µm |
| Alvium 1800 U-240m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-291m/c | 4.5 µm × 4.5 µm | 18 µm |
| Alvium 1800 U-319m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-320 VSWIR | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-500m/c | 2.2 µm × 2.2 µm | 15 µm |
| Alvium 1800 U-501m/c NIR | 2.2 µm × 2.2 µm | 15 µm |
| Alvium 1800 U-507m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-507m/c Pol | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-508m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-508m/c Pol | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-510m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-511m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-530 VSWIR | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-811m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-812 UV | 2.74 µm × 2.74 µm | 15 µm |
| Alvium 1800 U-895m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-1236m/c | 3.45 µm × 3.45 µm | 24 µm |
| Alvium 1800 U-1240m/c | 1.85 µm × 1.85 µm | 12 µm |
| Alvium 1800 U-1242m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-1620m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-2040m/c | 2.74 µm × 2.74 µm | 18 µm |
| Alvium 1800 U-2050m/c | 2.4 µm × 2.4 µm | 12 µm |
| Alvium 1800 U-2460m/c | 2.74 µm × 2.74 µm | 18 µm |

*Table 109: Sensor tilt (sheet 2 of 2)*

# User sets

## Supported features

UserSet features enable to store individual settings on Alvium USB cameras. These user sets can be loaded by default, without needing to set values by software after every restart of the camera. Or they can be used to switch between different settings, for example, to adjust from daylight to artificial light.

User sets on Alvium USB cameras support all features except for:

- Command features
- Read-only features
- Features in the LUTControl category#
- Selectors: Used to choose between various instances of a functionality.

## Trigger features and UserSetDefault

Trigger features are reset to default values when the default user set is loaded.

- Column UserSetLoad displays how user values are affected when the command UserSetLoad is executed.
- Column DeviceReset displays how user values are affected when the command DeviceReset is executed.

| Feature | Default value | UserSetDefault | DeviceReset |
|---|---|---|---|
| TriggerActivation | *RisingEdge* | Default value | Default value |
| TriggerMode | *Off* | Default value | Default value |
| TriggerSelector | *AcquisitionStart* | User value | Default value |
| TriggerSoftware | [Command] | Not applicable | Not applicable |
| TriggerSource | *Software* | Default value | Default value |

*Table 110: Trigger features being reset*

# Camera feature availability

Alvium 1800 U cameras support a number of standard and extended features. The following tables compare the availability of selected features by model.

**Feature description and firmware downloads**

Alvium Features Reference: www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation

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

| Image control | Monochrome models | Color models | Supported models |
|---|---|---|---|
| Adaptive noise correction | ✓ | ✓ | All, **except** for:<br>1800 U-507 Pol, -508 Pol |
| Auto exposure | ✓ | ✓ | All |
| Auto gain | ✓ | ✓ | All |
| Auto white balance | - | ✓ | All, **except** for:<br>1800 U-507 Pol, -508 Pol |
| Color transformation (including hue, saturation) | - | ✓ | |
| Contrast | ✓ | ✓ | |
| Custom convolution | ✓ | ✓ | |
| De-Bayering up to 5×5 | - | ✓ | |
| **Digital** binning | ✓ | ✓ | |
| DPC (defect pixel correction) | ✓ | ✓ | |
| FPNC (fixed pattern noise correction) | ✓ | ✓ | All, **except** for:<br>1800 U-030 VSWIR, -052, -130 VSWIR, -203, -234, -235, -291, -320 VSWIR, -507 Pol, -508 Pol, -530 VSWIR, -895, -2050 |
| Gamma | ✓ | ✓ | All |
| Lens shading correction | ✓ | ✓ | All, **except** for:<br>1800 U-050 |
| Look up table (LUT) | ✓ | ✓ | All, **except** for:<br>1800 U-507 Pol, -508 Pol |

*Table 111: Image control features by Alvium 1800 U model (sheet 1 of 2)*

| Image control | Monochrome models | Color models | Supported models |
|---|---|---|---|
| **Multiple** ROI (regions of interest) | ✓ | ✓ | All, **except** for: 1800 U-050, -120, -131, -192, -500, -501 NIR, -1240, -2050 |
| Reverse X/Y | ✓ | ✓ | All |
| **Sensor** binning | ✓ | - | 1800 U-158m, -203m, -240m, -291m, -500m, -501m NIR, -508m, -510m, -511m, -811m, -812 UV, -1242m, -1620m, -2040m, -2460m |
| Sharpness/Blur | ✓ | ✓ | All, **except** for: 1800 U-507 Pol, -508 Pol |
| **Single** ROI (region of interest) | ✓ | ✓ | All |

*Table 111: Image control features by Alvium 1800 U model (sheet 2 of 2)*

| Camera control | Monochrome models | Color models | Supported models |
|---|---|---|---|
| Acquisition frame rate | ✓ | ✓ | All |
| Bandwidth control (`DeviceLinkThroughputLimit`) | ✓ | ✓ | All |
| Counters and timers | ✓ | ✓ | All |
| Event channel | ✓ | ✓ | All, **except** for: 1800 U-050 |
| Firmware update in the field | ✓ | ✓ | All |
| Image chunk data | ✓ | ✓ | All, **except** for: 1800 U-050 |
| I/O and trigger control | ✓ | ✓ | All |
| Power saving mode | ✓ | ✓ | All |
| Sensor ADC readout modes (`SensorBitDepth`) | ✓ | ✓ | 1800 U-030 VSWIR, -040, -052, -130 VSWIR, -158, -203, -234, -235, -240, -291, -320 VSWIR, -508, -508 Pol, -530 VSWIR |

*Table 112: Camera control features by Alvium 1800 U model (sheet 1 of 2)*

| Camera control | Monochrome models | Color models | Supported models |
|---|---|---|---|
| Sequencer | ✓ | ✓ | All, **except** for:<br>1800 U-050, -120, -131, -192, -500, -501 NIR, -1240, -2050 |
| Serial I/Os | ✓ | ✓ | All |
| Temperature monitoring (mainboard) | ✓ | ✓ | All |
| Temperature monitoring (sensor) [1] | ✓ | ✓ | All, **except** for:<br>1800 U-050, -120, -131, -192, -234, -235, -1240, -2050 |
| User sets | ✓ | ✓ | All |
| [1] The sensor temperature can be output only when the camera is not streaming. | | | |

*Table 112: Camera control features by Alvium 1800 U model (sheet 2 of 2)*

# Lenses: Focal length vs. field of view

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.

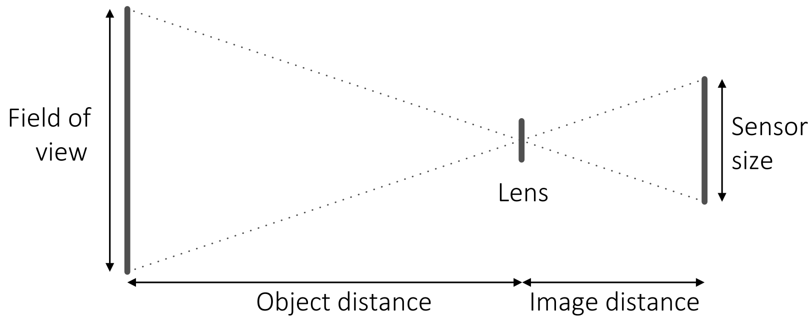



*Figure 92: Parameters used in tables for focal length versus FOV*

**Allied Vision S-Mount lenses**

For technical data of Allied Vision S-Mount lenses with dedicated operating instructions, see the S-Mount Lenses User Guide at www.alliedvision.com/fileadmin/content/documents/products/accessories/lenses/Allied_Vision/Data_sheet/S-Mount-Lenses_User-Guide.pdf.

## 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.

# About S-Mount lenses

Alvium S-Mount models have no filter. For typical applications, we recommend using S-Mount lenses with an integrated IR cut filter for a better image quality.

Read Mounting and focusing S-Mount lenses on page 280 to avoid damage when using S-Mount lenses.

# Focal length vs. field of view

## Alvium 1800 U-030 VSWIR

Values for 1800 U-030 VSWIR cameras with Type 1/4 (4.1 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 4 | 407 × 322 | 817 × 647 |
| 5 | 775 × 773 | 1557 × 1553 |
| 6 | 644 × 642 | 1296 × 1293 |
| 8 | 481 × 480 | 970 × 968 |
| 12 | 318 × 317 | 644 × 642 |
| 16 | 237 × 236 | 481 × 480 |
| 25 | 149 × 148 | 305 × 304 |
| 35 | 104 × 104 | 216 × 215 |
| 50 | 70 × 70 | 149 × 148 |

*Table 113: Focal length versus field of view for Alvium 1800 U-030 VSWIR*

## Alvium 1800 U-040m/c

Values for 1800 U-040m/c cameras with Type 1/2.9 (6.3 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 2.8 | 892 × 667 | 1789 × 1337 |
| 3.6 | 693 × 518 | 1390 × 1039 |
| 4.8 | 518 × 387 | 1041 × 778 |
| 6 | 414 × 309 | 832 × 622 |
| 8 | 309 × 231 | 623 × 465 |
| 12 | 204 × 153 | 414 × 309 |
| 16 | 152 × 114 | 309 × 231 |
| 25 | 95 × 71 | 196 × 146 |

*Table 114: Focal length versus field of view for Alvium 1800 U-040m/c*

## Alvium 1800 U-050m/c

Values for 1800 U-050m/c cameras with Type 1/3.6 (4.9 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 2.8 | 689 × 517 | 1381 × 1036 |
| 3.6 | 535 × 401 | 1073 × 805 |
| 4.8 | 400 × 300 | 804 × 603 |
| 6 | 319 × 239 | 643 × 482 |
| 8 | 239 × 179 | 481 × 361 |
| 12 | 158 × 118 | 319 × 239 |
| 16 | 117 × 88 | 239 × 179 |
| 25 | 74 × 55 | 151 × 113 |

*Table 115: Focal length versus field of view for Alvium 1800 U-050m/c*

# Alvium 1800 U-052m/c

Values for 1800 U-052m/c cameras with Type 1/1.7 (9.2 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 116: Focal length versus field of view for Alvium 1800 U-052m/c*

# Alvium 1800 U-120m/c

Values for 1800 U-120m/c cameras with Type 1/3 (6.0 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 2.8 | 852 × 639 | 1709 × 1282 |
| 3.6 | 662 × 496 | 1329 × 996 |
| 4.8 | 495 × 371 | 995 × 746 |
| 6 | 395 × 296 | 795 × 596 |
| 8 | 295 × 221 | 595 × 446 |
| 12 | 195 × 146 | 395 × 296 |
| 16 | 145 × 109 | 295 × 221 |
| 25 | 91 × 68 | 187 × 140 |

*Table 117: Focal length versus field of view for Alvium 1800 U-120m/c*

## Alvium 1800 U-130 VSWIR

Values for 1800 U-130 VSWIR 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 118: Focal length versus field of view for Alvium 1800 U-130 VSWIR*

## Alvium 1800 U-131m/c

Values for 1800 U-131m/c cameras with Type 1/1.8 (8.7 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 4.8 | 700 × 560 | 1407 × 1125 |
| 6 | 559 × 447 | 1124 × 899 |
| 8 | 417 × 334 | 841 × 673 |
| 12 | 276 × 221 | 559 × 447 |
| 16 | 205 × 164 | 417 × 334 |
| 25 | 129 × 103 | 265 × 212 |
| 35 | 90 × 72 | 187 × 150 |
| 50 | 61 × 49 | 129 × 103 |

*Table 119: Focal length versus field of view for Alvium 1800 U-131m/c*

# Alvium 1800 U-158m/c

Values for 1800 U-158m/c cameras with Type 1/2.9 (6.3 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 2.8 | 892 × 667 | 1789 × 1337 |
| 3.6 | 693 × 518 | 1390 × 1039 |
| 4.8 | 518 × 387 | 1041 × 778 |
| 6 | 414 × 309 | 832 × 622 |
| 8 | 309 × 231 | 623 × 465 |
| 12 | 204 × 153 | 414 × 309 |
| 16 | 152 × 114 | 309 × 231 |
| 25 | 95 × 71 | 196 × 146 |

*Table 120: Focal length versus field of view for Alvium 1800 U-158m/c*

# Alvium 1800 U-192m/c

Values for 1800 U-192m/c cameras with Type 1/1.8 (9.0 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 4.8 | 743 × 557 | 1493 × 1120 |
| 6 | 593 × 445 | 1193 × 895 |
| 8 | 443 × 332 | 893 × 670 |
| 12 | 293 × 220 | 593 × 445 |
| 16 | 218 × 163 | 443 × 332 |
| 25 | 137 × 103 | 281 × 211 |
| 35 | 96 × 72 | 199 × 149 |
| 50 | 65 × 49 | 137 × 103 |

*Table 121: Focal length versus field of view for Alvium 1800 U-192m/c*

## Alvium 1800 U-203m/c

Values for 1800 U-203m/c cameras with Type 1/1.7 (9.2 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 5 | 727 × 556 | 1461 × 1118 |
| 6 | 605 × 462 | 1217 × 930 |
| 8 | 452 × 345 | 911 × 696 |
| 12 | 299 × 228 | 605 × 462 |
| 16 | 222 × 170 | 452 × 345 |
| 25 | 140 × 107 | 286 × 219 |
| 35 | 98 × 75 | 202 × 155 |
| 50 | 66 × 51 | 140 × 107 |

*Table 122: Focal length versus field of view for Alvium 1800 U-203m/c*

## Alvium 1800 U-234m/c, 1800 U-235m/c

Values for 1800 U-234m/c and 1800 U-235m/c cameras with Type 1/1.2 (13.4 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 8 | 698 × 438 mm | 1407 × 884 mm |
| 12 | 461 × 290 mm | 933 × 586 mm |
| 16 | 343 × 215 mm | 697 × 438 mm |
| 25 | 215 × 135 mm | 442 × 278 mm |
| 35 | 150 × 94 mm | 312 × 196 mm |
| 50 | 102 × 64 mm | 215 × 135 mm |

*Table 123: Focal length versus field of view for Alvium 1800 U-234m/c and 1800 U-235m/c*

# Alvium 1800 U-240m/c

Values for 1800 U-240m/c cameras with Type 1/2.3 (7.9 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 4.8 | 691 × 433 | 1389 × 871 |
| 6 | 552 × 346 | 1110 × 696 |
| 8 | 412 × 258 | 831 × 521 |
| 12 | 272 × 171 | 552 × 346 |
| 16 | 203 × 127 | 412 × 258 |
| 25 | 127 × 80 | 261 × 164 |
| 35 | 89 × 56 | 185 × 116 |
| 50 | 60 × 38 | 127 × 80 |

*Table 124: Focal length versus field of view for Alvium 1800 U-240m/c*

# Alvium 1800 U-291m/c

Values for 1800 U-291m/c cameras with Type 2/3 (10.8 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 6 | 644 × 642 | 1296 × 1293 |
| 8 | 481 × 480 | 970 × 968 |
| 12 | 318 × 317 | 644 × 642 |
| 16 | 237 × 236 | 481 × 480 |
| 25 | 149 × 148 | 305 × 304 |
| 35 | 104 × 104 | 216 × 215 |
| 50 | 70 × 70 | 149 × 148 |

*Table 125: Focal length versus field of view for Alvium 1800 U-291m/c*

# Alvium 1800 U-319m/c

Values for 1800 U-319m/c 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 |
| 4.8 | 735 × 550 | 1476 × 1104 |
| 6 | 586 × 439 | 1180 × 882 |
| 8 | 438 × 328 | 883 × 661 |
| 12 | 290 × 217 | 586 × 439 |
| 16 | 215 × 161 | 438 × 328 |
| 25 | 135 × 101 | 278 × 208 |
| 35 | 95 × 71 | 196 × 147 |
| 50 | 64 × 48 | 135 × 101 |

*Table 126: Focal length versus field of view for Alvium 1800 U-319m/c*

# Alvium 1800 U-320 VSWIR

Values for 1800 U-320VSWIR 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 127: Focal length versus field of view for Alvium 1800 U-320 VSWIR*

## Alvium 1800 U-500m/c, 1800 U-501m/c NIR

Values for 1800 U-500m/c and 1800 U-501m/c NIR cameras with Type 1/2.5 (7.1 mm diagonal) sensors:

| **Focal length [mm]** | **Field of view (H × V in [mm])** | |
|---|---|---|
| | **Object distance = 500 mm** | **Object distance = 1000 mm** |
| 2.8 | 1013 × 759 | 2031 × 1523 |
| 3.6 | 786 × 590 | 1578 × 1184 |
| 4.8 | 588 × 441 | 1182 × 887 |
| 6 | 469 × 352 | 945 × 709 |
| 8 | 351 × 263 | 707 × 530 |
| 12 | 232 × 174 | 469 × 352 |
| 16 | 172 × 129 | 351 × 263 |
| 25 | 108 × 81 | 222 × 167 |

*Table 128: Focal length versus field of view for Alvium 1800 U-500m/c, 1800 U-501m/c NIR*

## Alvium 1800 U-507m/c, 1800 U-507m/c Pol, 1800 U-508m/c, 1800 U-508m/c Pol

Values for 1800 U-507m/c, 1800 U-507m/c Pol, 1800 U-508m/c, and 1800 U-508m/c Pol cameras Type 2/3 (11.1 mm diagonal) sensors:

| **Focal length [mm]** | **Field of view (H × V in [mm])** | |
|---|---|---|
| | **Object distance = 500 mm** | **Object distance = 1000 mm** |
| 6 | 700 × 584 | 1408 × 1175 |
| 8 | 523 × 436 | 1054 × 880 |
| 12 | 346 × 288 | 700 × 584 |
| 16 | 257 × 215 | 523 × 436 |
| 25 | 162 × 135 | 332 × 277 |
| 35 | 113 × 94 | 234 × 196 |
| 50 | 77 × 64 | 162 × 135 |

*Table 129: Focal length versus field of view for Alvium 1800 U-507m/c, 1800 U-507m/c Pol, 1800 U-508m/c, 1800 U-508m/c Pol*

# Alvium 1800 U-510m/c, 1800 U-511m/c

Values for 1800 U-510m/c and 1800 U-511m/c cameras with Type 1/1.8 (8.8 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [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 130: Focal length versus field of view for Alvium 1800 U-510 m/c, 1800 U-511m/c*

# Alvium 1800 U-530 VSWIR

Values for 1800 U-530 VSWIR 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 131: Focal length versus field of view for Alvium 1800 U-530 VSWIR*

# Alvium 1800 U-811m/c, 1800 U-812 UV

Values for 1800 U-811m/c and 1800 U-812 UV cameras with Type 2/3 (11.0 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 5 | 773 × 773 | 1553 × 1553 |
| 6 | 642 × 642 | 1293 × 1293 |
| 8 | 480 × 480 | 968 × 968 |
| 12 | 317 × 317 | 642 × 642 |
| 16 | 236 × 236 | 480 × 480 |
| 25 | 148 × 148 | 304 × 304 |
| 35 | 104 × 104 | 215 × 215 |
| 50 | 70 × 70 | 148 × 148 |

*Table 132: Focal length versus field of view for Alvium 1800 U-811m/c, 1800 U-812 UV*

# Alvium 1800 U-895m/c

Values for 1800 U-895m/c cameras with Type 1 (16.0 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 12 | 577 × 305 | 1168 × 618 |
| 16 | 429 × 227 | 873 × 462 |
| 25 | 270 × 143 | 553 × 293 |
| 35 | 189 × 100 | 391 × 286 |
| 50 | 128 × 68 | 270 × 143 |
| 100 | 57 × 30 | 128 × 68 |
| 135 | 38 × 20 | 91 × 48 |

*Table 133: Focal length versus field of view for Alvium 1800 U-895m/c*

## Alvium 1800 U-1236m/c

Values for 1800 U-1236m/c cameras with Type 1.1 (17.6 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 8 | 872 × 638 | 1759 × 1287 |
| 12 | 577 × 422 | 1168 × 854 |
| 16 | 429 × 314 | 872 × 638 |
| 25 | 270 × 197 | 553 × 405 |
| 35 | 188 × 138 | 391 × 286 |
| 50 | 128 × 93 | 270 × 197 |
| 75 | 80 × 59 | 175 × 128 |

*Table 134: Focal length versus field of view for Alvium 1800 U-1236m/c*

## Alvium 1800 U-1240m/c

Values for 1800 U-1240m/c cameras with Type 1/1.7 (9.33 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 4.8 | 763 × 578 | 1534 × 1161 |
| 6 | 609 × 461 | 1226 × 928 |
| 8 | 455 × 344 | 918 × 694 |
| 12 | 301 × 228 | 609 × 461 |
| 16 | 224 × 169 | 455 × 344 |
| 25 | 141 × 106 | 289 ×218 |
| 35 | 98 × 74 | 204 × 154 |
| 50 | 67 × 50 | 141 × 106 |

*Table 135: Focal length versus field of view for Alvium 1800 U-1240m/c*

# Alvium 1800 U-1242m/c

Values for 1800 U-1242m/c cameras with Type 1/1.1 (14.0 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 6 | 931 × 679 | 1874 × 1365 |
| 8 | 696 × 507 | 1403 × 1022 |
| 12 | 460 × 335 | 931 × 679 |
| 16 | 342 × 249 | 696 × 507 |
| 25 | 215 × 157 | 441 × 321 |
| 35 | 150 × 109 | 312 × 227 |
| 50 | 102 × 74 | 215 × 157 |
| 75 | 64 × 47 | 139 × 102 |

*Table 136: Focal length versus field of view for Alvium 1800 U-1242m/c*

# Alvium 1800 U-1620m/c

Values for 1800 U-1620m/c cameras with Type 1.1 (16.8mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 5 | 1445 × 825 | 2905 × 1658 |
| 6 | 1202 × 686 | 2419 × 1380 |
| 8 | 898 × 512 | 1810 × 1033 |
| 12 | 594 × 339 | 1202 × 686 |
| 16 | 442 × 252 | 898 × 512 |
| 25 | 277 × 158 | 569 × 325 |
| 35 | 194 × 111 | 403 × 230 |
| 50 | 131 × 75 | 277 × 158 |
| 75 | 83 × 47 | 180 × 103 |

*Table 137: Focal length versus field of view for Alvium 1800 U-1620m/c*

# Alvium 1800 U-2040m/c

Values for 1800 U-2040m/c cameras with Type 1.1 (17.5 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 6 | 1018 × 1018 | 2048 × 2048 |
| 8 | 760 × 760 | 1533 × 1533 |
| 12 | 503 × 503 | 1018 × 1018 |
| 16 | 374 × 374 | 760 × 760 |
| 25 | 235 × 235 | 482 × 482 |
| 35 | 164 × 164 | 341 × 341 |
| 50 | 111 × 111 | 235 × 235 |
| 75 | 70 × 70 | 152 × 152 |
| 85 | 60 × 60 | 133 × 133 |

*Table 138: Focal length versus field of view for Alvium 1800 U-2040m/c*

# Alvium 1800 U-2050m/c

Values for 1800 U-2050m/c cameras with Type 1 (15.9 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 8 | 811 × 542 | 1636 × 1093 |
| 12 | 536 × 358 | 1086 × 726 |
| 16 | 399 × 267 | 811 × 542 |
| 25 | 251 × 167 | 514 × 344 |
| 35 | 175 × 117 | 364 × 243 |
| 50 | 119 × 79 | 251 × 167 |
| 75 | 75 × 50 | 163 × 109 |
| 85 | 64 × 43 | 142 × 95 |
| 100 | 53 × 35 | 119 × 79 |

*Table 139: Focal length versus field of view for Alvium 1800 U-2050m/c*

# Alvium 1800 U-2460m/c

Values for 1800 U-2460m/c cameras with Type 1.2 (19.3 mm diagonal) sensors:

| Focal length [mm] | Field of view (H × V in [mm]) | |
|---|---|---|
| | Object distance = 500 mm | Object distance = 1000 mm |
| 8 | 898 × 776 | 1810 × 1566 |
| 12 | 594 × 513 | 1202 × 1040 |
| 16 | 442 × 382 | 898 × 776 |
| 25 | 277 × 240 | 569 × 492 |
| 35 | 194 × 168 | 403 × 348 |
| 50 | 131 × 114 | 277 × 240 |
| 75 | 83 × 72 | 180 × 156 |

*Table 140: Focal length versus field of view for Alvium 1800 U-2460m/c*

# 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.

# Sensor damage by ESD

**NOTICE**

**Possible damage to the sensor**

In Alvium USB cameras without a closed housing, sensors can be damaged by ESD. In the output image, this may become visible as bubbles or blobs, for example. For details, see the note in Possible damage to image sensors due to electrostatic discharge on page 69.

- Provide ESD protection measures in accordance with technical standards.
- Follow the instructions in ESD on page 65.

# Bare board cameras

If you intend to design an application using bare board cameras, please consider:

- Alvium bare board cameras are not aligned. You must align these cameras into housings individually, which is extremely difficult and expensive. As a possible solution, Alvium Frame cameras provide alignment areas and holes to fit into individual housings, see Alvium Frame- use your own optical mount on page 19.
- Aligning the sensor to the lens is extremely difficult and expensive. Therefore, we recommend you to do evaluation with housed cameras first.
- Bare board cameras are specialized components. We cannot give all data needed for any application in advance.
- Please let us partner with you for bare board camera applications to ensure a successful design.

# Serial numbers of Alvium® chips and bare board cameras

Bare board cameras do not have enough space for a label with all the required information. Therefore, they are shipped with a 25 mm × 25 mm sandwich label on the blister pack. In Figure 93, this label shows, for example:

- Product code: 14767 for a 1800 U-240c Bare Board 90 °Camera
- Alvium® chip SN (serial number): 183603543
- Camera SN (serial number): R7QW5 as digits and 2D code.

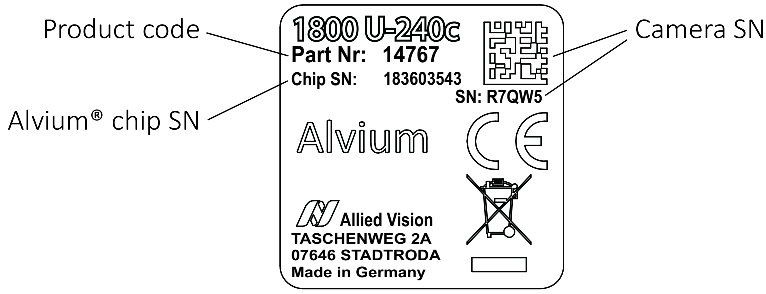



*Figure 93: Sandwich label on blister packs shipped for bare board cameras*

Before operating the camera, we recommend you to pull the sandwich label off the blister pack and stick it close to the camera.

If the label is lost, please read out with your smart phone the serial number of the Alvium® chip from the 2D code (a) shown in Figure 94. With this number, we can look up the serial number of the camera in our database.

If your smart phone cannot read the 2D code: In Figure 94, for example, the serial number (b) is 20450991.

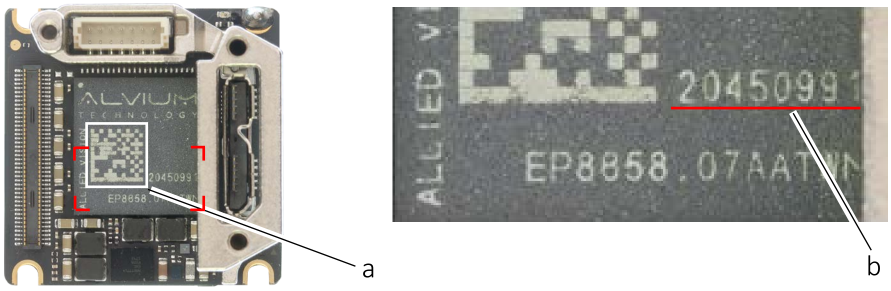



*Figure 94: Alvium® chip imprint with detail view (right)*

# Mounting the heat sink

Keep the operating temperature in the specified range to enable best image quality and to protect the camera from damage. We recommend you to equip Alvium bare board and open housing cameras with heat sinks.

**Optimizing heat dissipation**

For details, see the Optimum Heat Dissipation for Housed Alvium Cameras application note at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

**NOTICE**

**Damage to the camera by heat sinks mounted improperly**

- Allow mechanical contact only at the cooling area.
- Avoid any mechanical stress to the sensor and electronics area.
- Avoid short circuits of the electronics components.

**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.

**NOTICE**

**Damage to camera electronics**

Heat sinks can cause short circuits if they are not electrically isolated.

Avoid electrical contact between electronic components by unsuitable heat sinks and thermal conductive media.

Connect components in the cooling area (blue area in Figure 95) to a heat sink, following the instructions of the manufacturer of the heat sink and the thermal conductive media. Cooling area for Alvium USB 90° models are the same as for standard models.

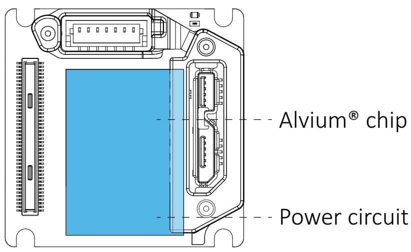



*Figure 95:* Cooling area for Alvium USB bare board cameras

**Heat sink compound**

Because electronic parts vary in height, we have updated our recommendation:

- Use flexible heat sink compound to compensate for potential gaps between the electronic parts to be cooled and heat sinks.
- Consider 1 mm to cover for worst case scenarios.
- For details, see the Alvium STEP files at www.alliedvision.com/en/support/alvium-step-file-downloads.

# 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.
- 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 279.
- We recommend you to apply thread locking.
- Use a lens support for heavy lenses.

## Mounting bare board cameras

**Heat dissipation and electromagnetic compatibility for bare board cameras**

For heat dissipation, see the Optimum Heat Dissipation for Alvium Cameras application note.

For initial guidance on electromagnetic compatibility, see the Electromagnetic Compatibility for Open Housing Alvium Cameras application note.

See www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

**NOTICE**

**Damage to the camera by improper mounting**

- Allow mechanical contact only at the mounting area.
- Avoid any mechanical stress to the sensor and the electronics area.
- Avoid short circuits of the electronics components.
- Give 2 mm minimum clearance above board components.
- Tighten screws at 0.1 Nm maximum torque.

**Sensor alignment for bare board cameras**

The sensors in Alvium bare board cameras are not aligned to a lens mount. You must align these cameras into housings individually, which can be difficult and expensive. As a possible solution, Alvium Frame cameras provide alignment areas and holes to fit into individual housings, see Alvium Frame- use your own optical mount on page 19.

Schematic drawings in Figure 96 show Alvium USB bare board cameras. Only the mounting area (gray) can be used for mounting. The sensor and electronics area (red) must not be touched nor put at mechanical stress.
a = Mounting hole | b = Mounting hole and chassis ground

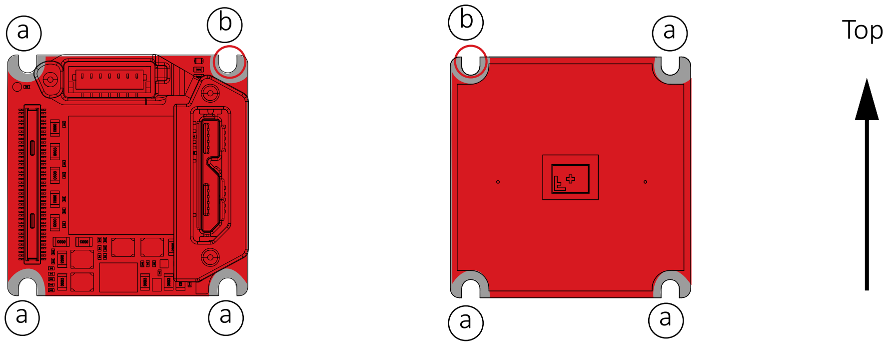
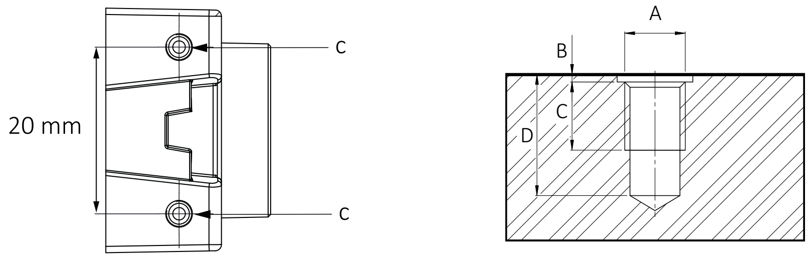



*Figure 96: Mounting area of Alvium USB bare board cameras connector side (left); sensor side (right)*

Mount the bare board with four M1.6 screws at 0.1 Nm maximum torque.
Mounting areas for Alvium USB 90° models are the same as for standard models.

# Mounting housed standard cameras

## Bottom or top mounting




Detail c:
C/CS-Mount: A=M3 | B=0.3 | C=3.4 | D=4.7
S-Mount: A=M3 | B=0.3 | C=2.2 | D=4.0

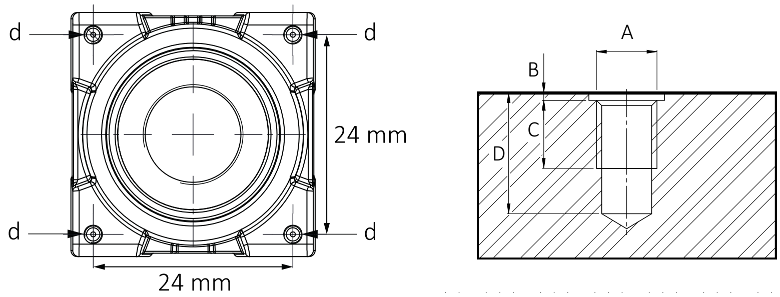
*Figure 97: Top and bottom and mounting threads (c)*

**The maximum torque value applies only if the entire thread engagement is used.** For other values, see Adapting maximum torque values on page 279.

1. Mount the camera to the base using suitable M3 screws,
   a. **C-Mount, CS-Mount**: At 0.79 Nm maximum torque for a thread engagement (C) of 3.4 mm between screws and mounting threads.
   b. **S-Mount**: At 0.51 Nm maximum torque for a thread engagement (C) of 2.2 mm between screws and mounting threads.

   See Figure 97. For technical drawings, see Standard Alvium: Technical drawings on page 220 and Alvium Flex: Technical drawings on page 236.
2. Continue with Mounting the lens on page 279.

## Front mounting




Detail d:
A=M2 | B=0.3 | C=2.3 | D=3.5

*Figure 98: Camera front with mounting threads (d)*

**The maximum torque value applies only if the entire thread engagement is used.** For other values, see Adapting maximum torque values on page 279.

1. Mount the camera to the base using suitable M2 screws at 0.23 Nm maximum torque for a thread engagement (C) of 2.3 mm between screws and mounting threads.

   See Figure 98. For technical drawings, see Standard Alvium: Technical drawings on page 220 and Alvium Flex: Technical drawings on page 236.
   We recommend you to additionally use bottom and top mounting threads for a more solid connection.
2. Continue with Mounting the lens on page 279.

## Installing Alvium Frame cameras

**CAUTION**

**Risk of cuts by sharp edges of the circular front opening**

- Avoid touching these edges with your fingers.
- Wear protective gloves for handling Alvium Frame cameras with an open circular front opening.

**NOTICE**

**Damage to the sensor**

The sensor can be damaged if the sensor surface is exposed to dirt or mechanical stress.

- Ensure that lenses or objects, such as optical elements do not exceed the specified maximum protrusion.
- Keep your fingers and tools outside the area inside the frame flange.
- Provide the following conditions to keep dirt and droplets out of the optical system of camera:
  - Dust-free environment
  - Low relative humidity
  - No condensation.

### Aligning the sensor with your optical system

Alvium Frame cameras are manufactured so that the sensor is aligned with your optical system with optimal precision. You can select between alignment methods:

**A**: Using the lateral alignment areas (1) and the front alignment area (2).

**B**: Using the front area (2) and the two alignment holes (3).

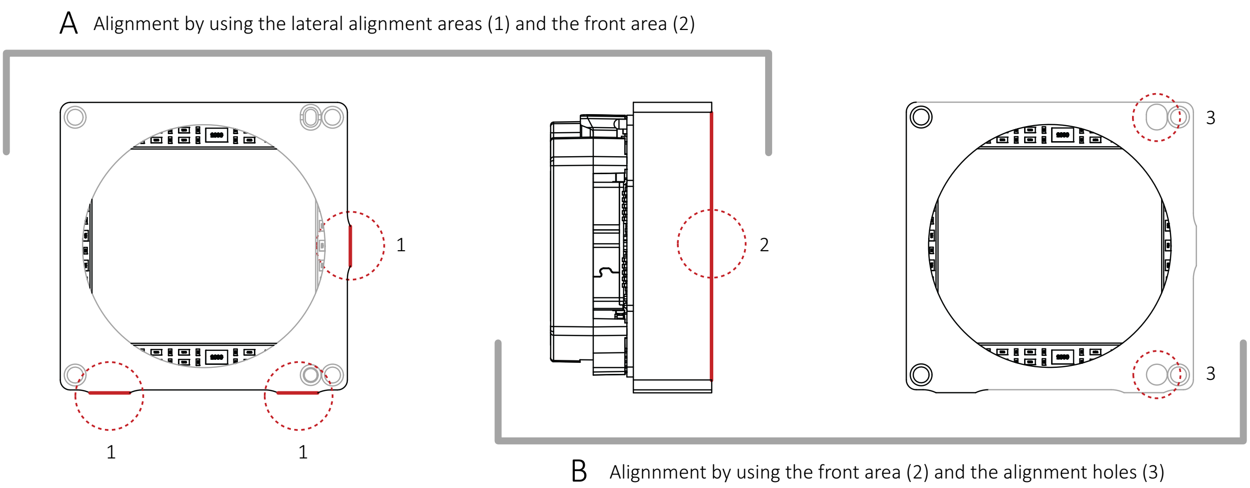



*Figure 99: Alignment methods*

**Dimensions and accuracy**

For the dimensions and accuracy of the alignment areas and the alignment holes, see Alvium Flex: Technical drawings on page 236.

For the accuracy of the sensor position, see Housed standard and Flex cameras: Sensor shift and rotation on page 245 and Housed Alvium USB cameras: Sensor tilt on page 246.

When you design Alvium Frame cameras into your system, observe values for:

- Flange focal distance, optical: 3.576 mm
- Maximum protrusion of 1.5 mm into the frame measured from the front area (2).

## Mounting Alvium Frame

Especially for dynamic applications with high acceleration, mount the camera using all 4 mounting threads.

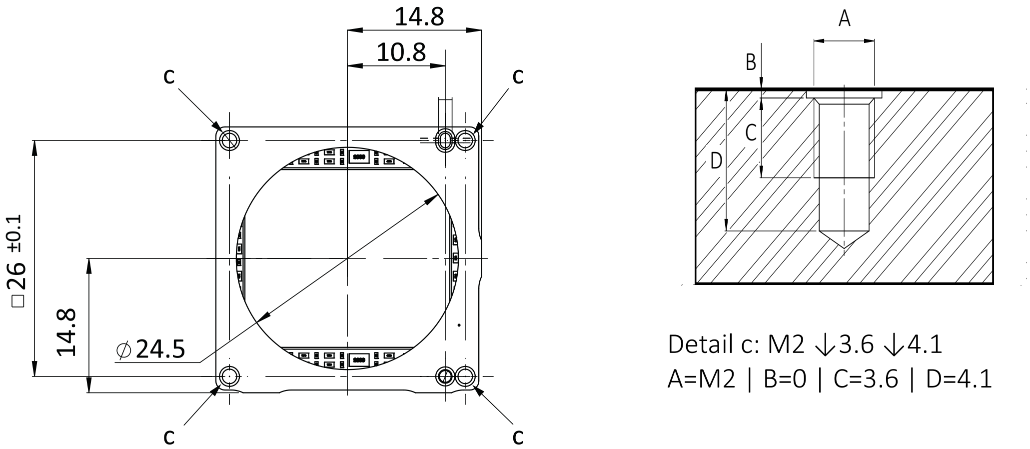



*Figure 100: Mounting threads Alvium Frame*

**The maximum torque value applies only if the entire thread engagement is used.** For other values, see Adapting maximum torque values. For technical drawings, with further values and tolerances, and references for alignment, see Alvium Frame: Technical drawings on page 240.

As shown in Figure 100, mount the camera to the base using suitable M2 screws for the 4 mounting threads: At 0.4 Nm maximum torque for a thread engagement (C) of 3.6 mm between screws and mounting threads.

## Adapting maximum torque values

This is a general example. Use the corresponding values for your camera. The total screw length composes of the mounting holes length and the height of your mounting base. For using less than the recommended length of thread engagement, calculate maximum torque as follows:

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

Example for a length of thread engagement of **2.0 mm** instead of 2.3 mm:
**2.0 mm** / 2.3 mm × 0.23 Nm = **0.20 Nm**

| Thread group | Thread position | Thread type | Total protrusion | Length of thread engagement | Maximum torque |
|---|---|---|---|---|---|
| d | Front mounting | M2 | 2.6 mm | 2.3 mm | 0.23 Nm |
| d | Front mounting | M2 | 2.6 mm | **2.0 mm** | **0.20 Nm** |

*Table 141: Adjusting maximum torque values*

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

**Tripod adapter**

For more information, see www.alliedvision.com/en/products/accessories.

# Mounting the lens

Observe the following notes before you mount lenses to Alvium USB 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, optics, or electronics by unsuitable lenses**

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

- Use lenses only up to the specified maximum protrusion, see Maximum protrusion for front mounts on page 243.
- S-Mount lenses must be screwed into the camera at less than max. protrusion (11.0 mm), see Mounting and focusing S-Mount lenses on page 280.
- Avoid short S-Mount lenses falling into the camera.

# Mounting and focusing S-Mount lenses

**Allied Vision S-Mount lenses**

For technical data of Allied Vision S-Mount lenses with dedicated operating instructions, see the S-Mount Lenses User Guide at www.alliedvision.com/fileadmin/content/documents/products/accessories/lenses/Allied_Vision/Data_sheet/S-Mount-Lenses_User-Guide.pdf.

This section instructs how to use S-Mount lenses with your camera safely. S-Mount lenses are screwed into the mount to adjust focus. Vibration moves lenses out of position. Several techniques can be used to fasten S-Mount lenses in focus. We recommend using fixing nuts. See instructions in this section.

**Drawings and fixing nuts**

- Drawings in the instructions are schematic.
- Several manufacturers offer various types of S-Mount fixing nuts. The type shown in the instructions drawings is an example.
- We recommend using pinch nose pliers to tighten fixing nuts.

Figure 101 shows how fixing nuts lock S-Mount lenses.

Follow the instructions to lock the lens in focus position.

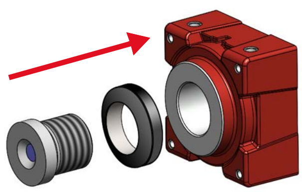


Figure 101: Fixing nut locking an S-Mount lens

**NOTICE**

**Damage to sensor, optics, or electronics by improper handling**

If an S-Mount lens is screwed against the sensor or electronics, sensor, lens, or electronics can be damaged.

- Screw in the lens at less than 11.0 mm maximum protrusion.
- Follow the instructions carefully.

**Determining the allowed range for the position of the lens**

1. Measure the length of the lens.

2. Calculate: **a = c – b**
   a: length of the mounted lens, measured from lens mount front flange
   b: maximum protrusion (11.0 mm)
   c: length of the lens

   See Maximum protrusion for front mounts on page 243.

3. Set a gauge to the length of (a).

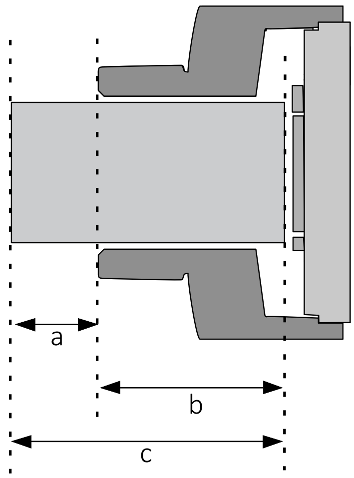



Figure 102: S-Mount lens and maximum protrusion

**Mounting the fixing nut to the lens**

4. Screw the fixing nut clockwise onto the lens until you can hold the front part (d) of the lens with your finger tips.

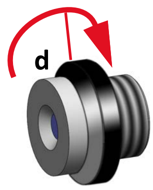



Figure 103: Lens and fixing nut

**Focusing the lens**

5. **Checking (a) with a gauge**, slowly screw the lens clockwise into the lens mount until the image is roughly in focus.

6. Slowly screw in and unscrew the lens until you have found the most accurate focus.

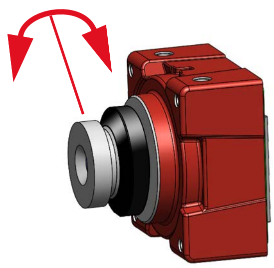


Figure 104: Adjusting focus

**NOTICE**

**Damage to lens threads and fixing nut by excessive force**

If the fixing nut is screwed with too much force, threads are worn out and the lens cannot be locked anymore.

Screw fixing nuts hand tight to keep the lens in a fixed position.

**Locking focus**

Pinch nose pliers are used to screw the fixing nut:

7. Holding the lens in position with one hand, screw the fixing nut clockwise against the lens mount until you feel the lens is locked.

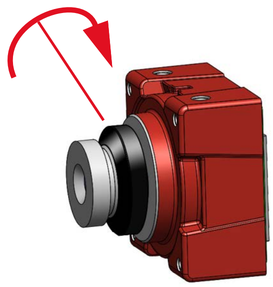


Figure 105: Tightening the fixing nut

**Checking focus is set and locked properly**

8. Check No.1: Try to rotate the lens with little force in both directions to ensure the lens is safely locked in position.

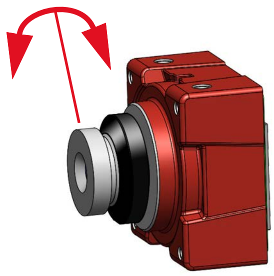


Figure 106: Checking lens is safely locked

9. Check No. 2: S-Mount thread allows a slightly tilted lens position. In this case, focus for a common object plane varies over the image plane.
   **If focus is constant** over the image plane, you are done.
   **If focus varies** over the image plane, the lens is tilted. Continue with 10.

10. Loosen the fixing nut.

11. Continue with 6.

The lens is locked in focus and ready for operation.

# Software and driver installation on the host

**Easy camera access with Vimba X**

This section lists general requirements to operate Alvium USB cameras on your system.

To download **Vimba X SDK** for Windows, Linux, Linux/ARM, and macOS, including **Vimba X Viewer**, **Firmware Updater**, and **Driver Installer** for Windows, see www.alliedvision.com/en/products/software/vimba-x-sdk.

For more details see **ReleaseNotes_Linux.txt** or **ReleaseNotes_Windows.txt** in the directory of your **Vimba X** installation, or see www.alliedvision.com/en/products/software/vimba-x-sdk.

## Required components

**Driver installation and OS support**

**Windows**: Please use **Vimba X** to install the camera driver. For **Vimba X** system requirements and supported Windows versions, see www.alliedvision.com/en/products/software/vimba-x-sdk.

**Linux**: Allied Vision does not provide a special driver. For **Vimba X** system requirements and supported operating systems, see www.alliedvision.com/en/products/software/vimba-x-sdk.

You need the following accessories:

- USB 3.0 or 3.1 Gen 1 external host controller card or on-board host controller
- USB 3.0 or 3.1 Type-A to Micro-B cable.

**Compatible USB 3.0 or 3.1 Gen 1 accessories**

See www.alliedvision.com/en/products/accessories.

# Connecting the camera to the host

## Connecting USB cables

Providing sufficient **strain relief** to avoid camera damage:

Plug the Micro USB 3.0 connector of the USB cable to the camera and fasten the locking screws. Connect the other USB connector to the host.

**Compatible USB 3.0 cables**

For USB 3.0 interface cables, industrial grade, with screw locks, Standard-A to Micro-B, see www.alliedvision.com/en/products/accessories.

## Installing the camera driver using Vimba X on a Windows system

Instructions in this chapter describe installation of the camera driver using **Vimba X** on a Windows system. On Linux systems, the generic driver for USB3 Vision devices is used.

**Unexpected events**

Should installation or operation not work properly, see Performance and troubleshooting on page 313.

### Using the camera with third-party drivers

Alvium USB cameras may not support third-party drivers. We recommend using the **Vimba X** camera driver.

## Installing drivers for camera and host adapter

### Installing the host adapter and Vimba X

1. Install the USB 3.0 or 3.1 Gen 1 host controller card and driver according to the manufacturer’s instructions.
2. Download and install **Vimba X**: www.alliedvision.com/en/products/software/vimba-x-sdk
3. Continue with Installing the camera driver.

## Installing the camera driver

**Connecting the camera to a USB 2.0 port**

If the Alvium USB camera is connected to a USB 2.0 port, the **Vimba X** driver can be installed and the camera can be configured and operated. But for full performance, the camera must be connected to a USB 3.0 or 3.1 Gen 1 port.

**Command line driver installer**

**Vimba X** also provides a command line driver installer. For more information about the **Vimba X Driver Installer**, see the manual, included in the **Vimba X** download.

During the **Vimba X** installation, select at least **camera demonstration** and **Vimba X applications** to operate Alvium USB cameras. If the camera is not recognized or to subsequently change an assigned driver, follow the instructions:

1. Connect your Alvium USB camera to the computer using a USB 3.0 or 3.1 Type-A to Micro-B cable.
2. Start **Vimba X Driver Installer** and open the **USB3 Vision Cameras** tab.
   The **Driver Source** is not installed, yet.
   If other USB3 Vision devices are installed, another USB3 Vision driver may be assigned to your camera.
3. Click the Alvium USB camera entry.
   The current **Vimba X** driver is offered as a popup (Vimba 3.0.0 in the example).
4. Open **Install driver > USB3 Vision Camera** and click the driver popup.

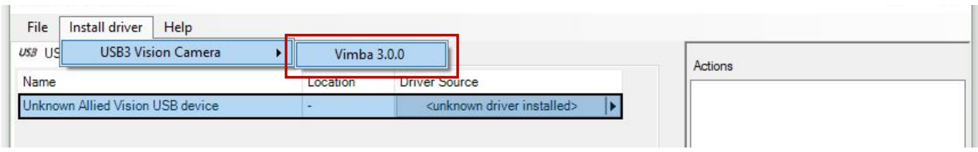



*Figure 107: Vimba X Driver Installer, camera driver not installed*

5. Click **Apply** to install the **Vimba X** driver for the camera.

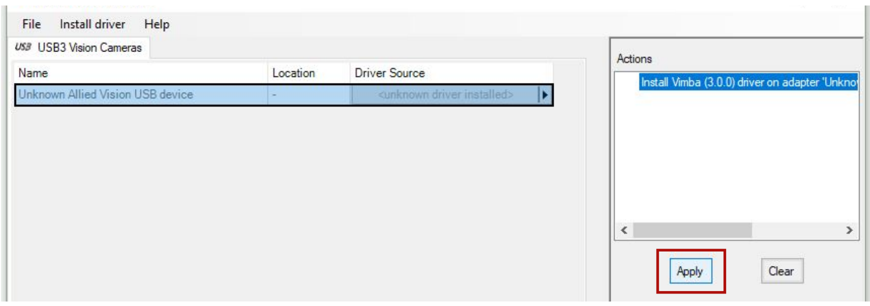



*Figure 108: Vimba X Driver Installer, driver installation started*

The driver has been installed successfully, the camera is recognized.

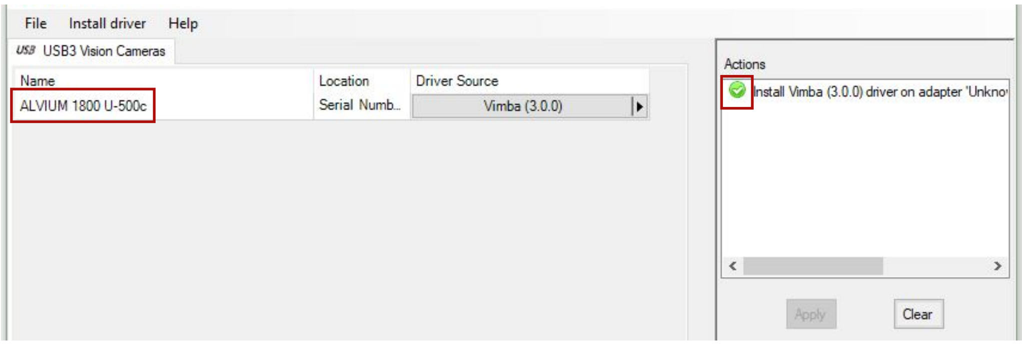



*Figure 109: Vimba X Driver Installer, driver installed successfully*

**Manual Vimba X driver installation**

Windows: For manual **Vimba X** driver installation, see the following instructions.

## Installing the camera driver with Windows tools

As an alternative practice, you can install the **Vimba X** driver manually. Check for connected USB devices on your Windows system.

**Screenshots are examples**

The following screenshots were taken on a test system. The view may be different, depending on the configuration of your system.

Under Windows, the **Device Manager** provides an overview of USB resources and connected devices. As long as the **Vimba X** USB device driver is not installed, the camera is not recognized.

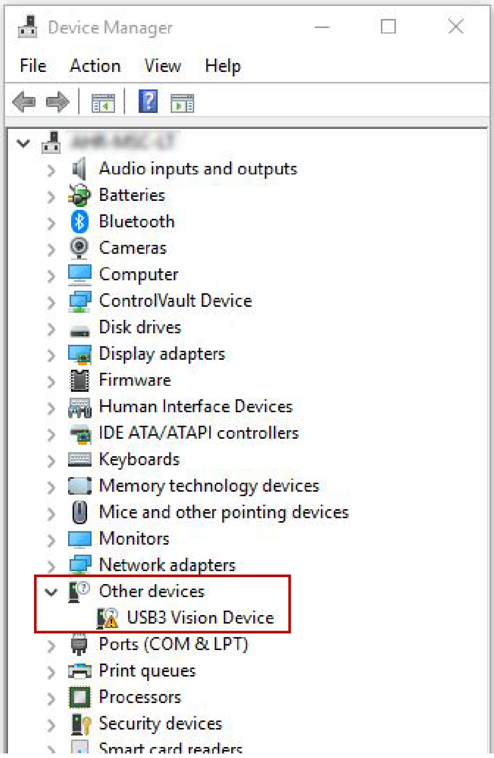



*Figure 110: Windows Device Manager, unrecognized USB3 Vision camera*

If no **USB3 Vision Device** is shown under the section **Other devices**, continue with action step 1. Otherwise, continue with action step 3.

1. Look at the section **Universal Serial Bus controllers**.
2. Disable the new found **USB Composite Device** and enable it again.
   This creates the entry under the section **Other Devices** as shown in Figure 110.

3. Right-click the unrecognized **USB3 Vision Device** and select *`Update driver`*.

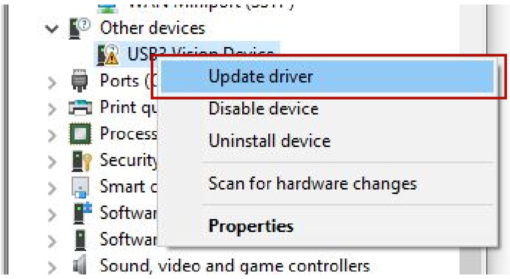



*Figure 111: Windows Device Manager, Windows Driver Installer*

4. Click: “Browse my computer for driver software”.
5. Select [Your local Vimba X directory]\Allied Vision\Vimba X\Driver.
6. Follow the instructions.
   The camera driver is installed successfully.

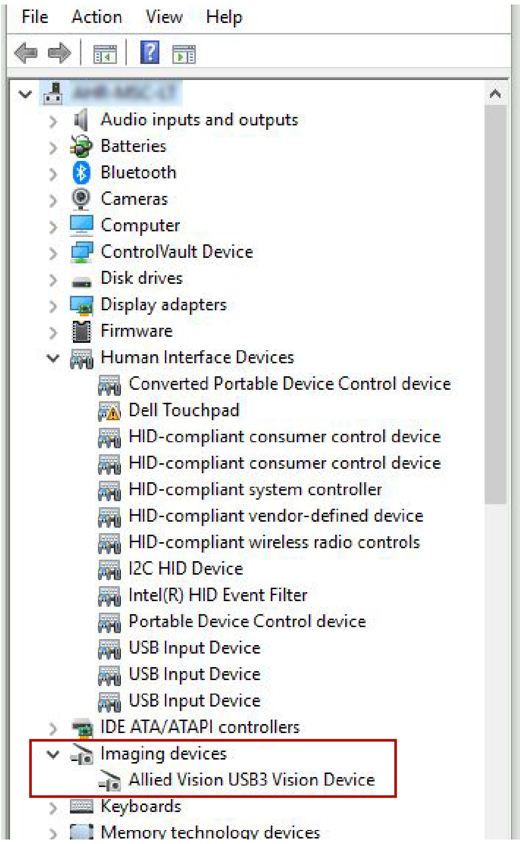



*Figure 112: Windows Device Manager, USB3 Vision camera installed successfully*

# Camera interfaces

This chapter includes:

# Standard Alvium and Alvium Frame: Connections

## Recommended accessories

**Compatible electronics accessories**

See www.alliedvision.com/en/products/accessories.

## Back panel

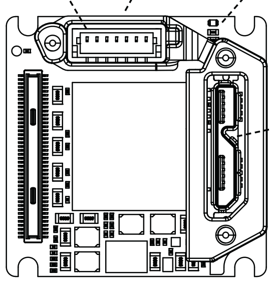



*Figure 113: Bare board camera*

### Interface descriptions

| Interface | Section in this user guide |
|---|---|
| I/O connector | Non-isolated, programmable GPIOs on page 298 |
| Status LED | Status LED on page 300 |

*Table 142: Interface descriptions overview*

For I/O connector pin assignment, see I/O connector pin assignment on page 291.

# I/O connector pin assignment

**I/O connector details**

JST BM07B-SRSS-TBT connector set consists of:

- Camera connector: JST BM07B-SRSS-TBT
- Cable housing: JST SHR-07V-S
- Cable, crimp contacts: JST SSH-003T-P0.2-H

See www.jst.de for details.

**I/O cables and electromagnetic interference (EMI)**

Consider for I/O cables by Allied Vision:

- 12319 JST I/O cables without screw lock have no shielding and are designed to be used with bare board or open housing Alvium cameras.
- For applications without an additional EMC housing, use shielded cables, such as 12322 JST I/O cables **with screw lock**.

**NOTICE**

**Damage by reverse polarity**

If Alvium USB cameras are externally powered with reverse polarity, the cameras can be damaged.

Power Alvium USB cameras according to the specifications described in this section.

**NOTICE**

**Damage by serial communication voltage levels**

If you are using serial communication (UART, similar to RS232), keep voltage levels in the range defined in Table 143 on page 292. Typical RS232 voltage levels (such as ±10 VDC) are not supported without external circuitry.

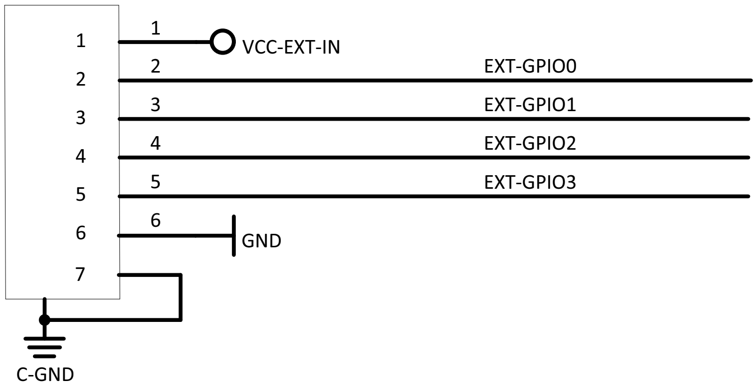



*Figure 114: Pin assignment of JST BM07B-SRSS-TBT type I/O connector*

| Pin | Signal | Direction | Level | Description |
|---|---|---|---|---|
| 1 | VCC-EXT-IN | PWR IN | 5 VDC (±10%)<br>See Power supply voltage for I/O cables on page 297. | Power supply voltage<br>See Camera power on page 66. |
| 2 | EXT-GPIO0 | IN/OUT | $U_{in}$ (low) = -0.3 to 0.8 VDC<br>$U_{in}$ (high) = 2.0 to 5.5 VDC<br>$U_{out}$ (low) = 0 to 0.4 VDC<br>$U_{out}$ (high) = 2.4 to 3.3 VDC at max. 12 mA | GPIO: Line0<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 3 | EXT-GPIO1 | IN/OUT | See Pin 2, EXT-GPIO0 | GPIO: Line1<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 4 | EXT-GPIO2 | IN/OUT | See Pin 2, EXT-GPIO0 | GPIO: Line2<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 5 | EXT-GPIO3 | IN/OUT | See Pin 2, EXT-GPIO0 | GPIO: Line3<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 6 | GND | — | 0 VDC | Power supply ground |
| 7 | C-GND | — | 0 VDC | Chassis ground and shielding |

*Table 143: Pin assignment of the JST BM07B-SRSS-TBT type I/O connector*

# Alvium Flex: Connections

## Observe for DF40C-50DP-0.4V connectors

Because using the Hirose DF40C-50DP-0.4V connector on Alvium Flex cameras is a novelty, no standard can be applied for the pinning. Therefore, connect your individual electronic parts only if you are an electronics expert. Otherwise, we recommend you to use boards and cables offered by Allied Vision for testing and evaluation, but also for final applications.

**Alvium Flex accessories**

See the Alvium Flex Design and Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## Back panel

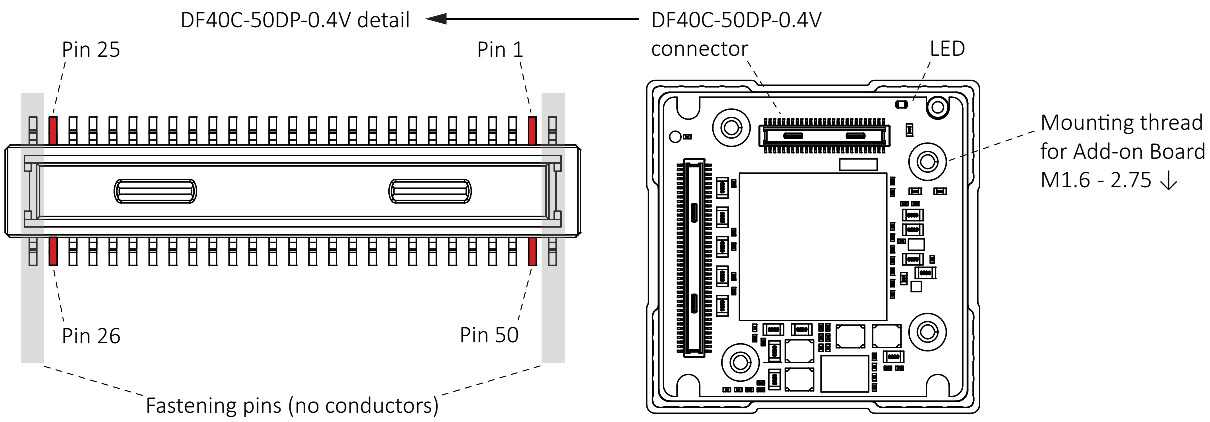



*Figure 115: Alvium Flex camera back panel*

## DF40C 50DP-0.4V connector pin assignment

Alvium USB Flex cameras have a 50-pin Hirose DF40C-50DP-0.4V connector.

**NOTICE**

**Damage to the camera by reverse polarity**

If Alvium USB cameras or camera I/Os are powered with reverse polarity, camera electronics can be damaged.

- Use Alvium Flex accessories by Allied Vision.
- Observe polarity for camera and I/O power.

NOTICE

**Damage by serial communication voltage level**

If you are using serial communication (UART, similar to RS232), keep voltage levels in the range defined in Table 143 on page 292. Typical RS232 voltage levels (such as ±10 VDC) are not supported without external circuitry.

**More information on Hirose DF40C-50DP-0.4V connector**

- For instructions and electronic specifications of Alvium Flex accessories, see the Alvium Flex Design and Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.
- For technical data and more instructions on the Hirose DF40C-50DP-0.4V connector, see the manufacturer data sheet at www.hirose.com.

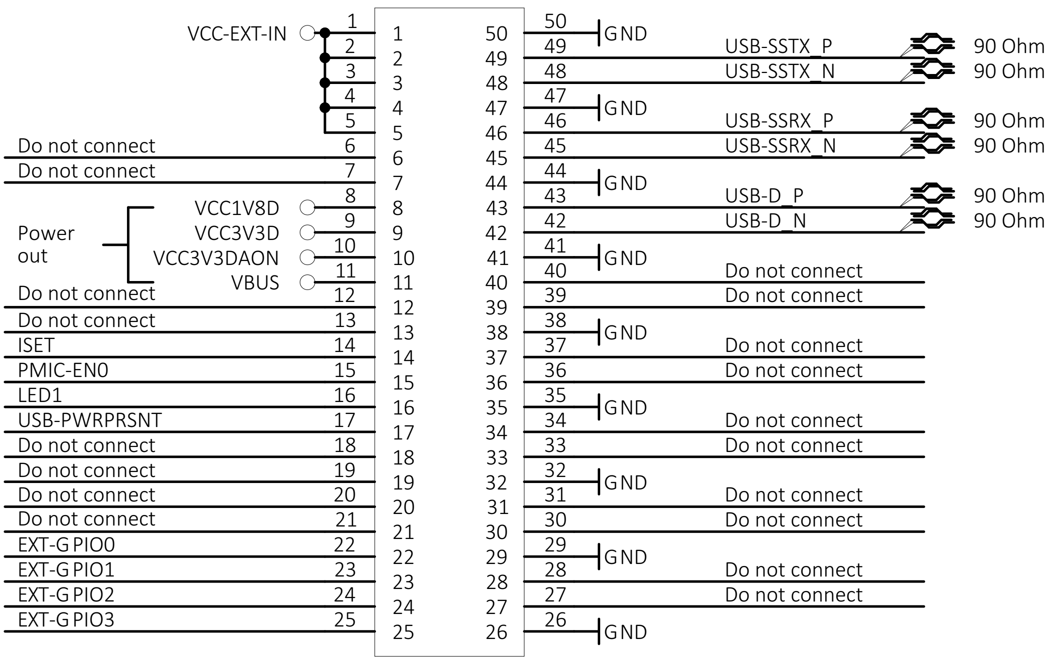



*Figure 116: Hirose DF40C-50DP-0.4V connector pin assignment*

**USB Receiver and Transmitter**

The signals for USB Receiver and Transmitter are seen from the camera side, as defined by the USB specification.

| Pin | Signal | Direction | Level | Description |
|---|---|---|---|---|
| 1 to 5 | VCC-EXT-IN | PWR IN | 4.5 to 5.5 VDC | Power supply voltage<br>Maximum input current: 1.5 A |
| 6 | Do not connect | | | |
| 7 | Do not connect | | | |
| 8 | VCC1V8D | PWR OUT | max. 1.8 VDC | Power output<br>Please contact Allied Vision Support if you want to use PWR OUT. |
| 9 | VCC3V3D | PWR OUT | max. 3.3 VDC | |
| 10 | VCC3V3DAON | PWR OUT | max. 3.3 VDC | |
| 11 | VBUS | PWR OUT | 4.0 to 5.5 VDC | Power output<br>Please contact Allied Vision Support if you want to use PWR OUT. |
| 12 | Do not connect | | | |
| 13 | Do not connect | | | |
| 14 | ISET | IN | Not applicable | To increase the camera's default internal current limit of 900 mA, connect an 820 Ω resistor to GND and add an external power supply. |
| 15 | PMIC-EN0 | IN | $U_{in}$ (low) =-0.3 to 0.4 VDC<br>$U_{in}$ (high) = 1.4 to 5.5 VDC | Camera power supply enable switch (active high, internal 100 kΩ pull-up resistor, default on) |
| 16 | LED1 | OUT | 3.3 VDC at 4 mA | Status LED output |
| 17 | USB-PWRPRSNT | IN | $U_{in}$ (low) =-0.3 to 0.8 VDC<br>$U_{in}$ (high) = 2.0 to 5.5 VDC | Connect to USB-VBUS via resistor divider (R1 10 kΩ, R2 100 kΩ), add 100 nF capacitor to GND |
| 18 | Do not connect | | | |
| 19 | Do not connect | | | |
| 20 | Do not connect | | | |
| 21 | Do not connect | | | |
| 22 | EXT-GPIO0 | IN/OUT | $U_{in}$ (low) = -0.3 to 0.8 VDC<br>$U_{in}$ (high) = 2.0 to 5.5 VDC<br>$U_{out}$ (low) = 0 to 0.4 VDC<br>$U_{out}$ (high) = 2.4 to 3.3 VDC at max. 12 mA | GPIO: Line0<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 23 | EXT-GPIO1 | IN/OUT | See Pin 22, EXT-GPIO0 | GPIO: Line1<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 24 | EXT-GPIO2 | IN/OUT | See Pin 22, EXT-GPIO0 | GPIO: Line2<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 25 | EXT-GPIO3 | IN/OUT | See Pin 22, EXT-GPIO0 | GPIO: Line3<br>Internal pull-up resistor: 33 kΩ to 63 kΩ |
| 26 | GND | — | 0 VDC | Power supply ground |
| 27 | Do not connect | | | |
| 28 | Do not connect | | | |
| 29 | GND | — | 0 VDC | Power supply ground |
| Only signals shown in green must be connected for basic camera operation. | | | | |

*Table 144: Hirose DF40C-50DP-0.4V connector pin assignment (sheet 1 of 2)*

| Pin | Signal | Direction | Level | Description |
|---|---|---|---|---|
| 30 | Do not connect | | | |
| 31 | Do not connect | | | |
| 32 | GND | — | 0 VDC | Power supply ground |
| 33 | Do not connect | | | |
| 34 | Do not connect | | | |
| 35 | GND | — | 0 VDC | Power supply ground |
| 36 | Do not connect | | | |
| 37 | Do not connect | | | |
| 38 | GND | — | 0 VDC | Power supply ground |
| 39 | Do not connect | | | |
| 40 | Do not connect | | | |
| 41 | GND | — | 0 VDC | Power supply ground |
| 42 | USB-D_N | Defined by the USB specification | | USB 2.0 differential pair |
| 43 | USB-D_P | | | |
| 44 | GND | — | 0 VDC | Power supply ground |
| 45 | USB-SSRX_N | Defined by the USB specification | | USB SuperSpeed reveiver differential pair |
| 46 | USB-SSRX_P | | | |
| 47 | GND | — | 0 VDC | Power supply ground |
| 48 | USB-SSTX_N | Defined by the USB specification | | USB SuperSpeed transmitter differential pair |
| 49 | USB-SSTX_P | | | |
| 50 | GND | — | 0 VDC | Power supply ground |
| Only signals shown in green must be connected for basic camera operation. | | | | |

*Table 144: Hirose DF40C-50DP-0.4V connector pin assignment (sheet 2 of 2)*

# All Alvium USB: Connections

## I/O use for UART

Table 145 shows which values must be selected to control I/Os using `LineSelector`.

| Signal | LineSelector (GenICam) | UART line |
|---|---|---|
| EXT-GPIO 0 | Line0 | Not applicable |
| EXT-GPIO 1 | Line1 | Not applicable |
| EXT-GPIO 2 | Line2 | UART Tx |
| EXT-GPIO 3 | Line3 | UART Rx |

*Table 145: Value settings to control I/Os using the LineSelector feature*

**Feature descriptions**

For more information in `LineSelector` and `SerialHub` features, see the Alvium Features Reference at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## Power supply voltage for I/O cables

If you are using I/O cables, voltage drops may result, causing the following issues:

- The camera cannot be operated.
- The camera does not respond to trigger pulses.
- The output signal to control devices connected to the camera is not recognized.

### Compensation

To provide a proper power supply voltage, adjust the DC input voltage at the open ends of the cable as shown in Table 146.

**NOTICE**

**Damage to camera electronics**

The following values apply to the Allied Vision I/O cables shown.

If you are using your own cables, ensure the power supply voltage at the camera connector side is 4.5 to 5.5 VDC.

| Product code | Length | Cable type | Power supply voltage (at the open ends of the cable) |
|---|---|---|---|
| 12319 | 0.4 m | 7-Pin JST I/O cable without screw lock to open ends | 4.5 to 5.5 VDC |
| 12322 | 3.0 m | 7-Pin JST I/O cable with screw lock to open ends | 4.5 to 5.5 VDC |
| 17070 | 5.0 m | 7-Pin JST I/O cable with screw lock to open ends | 5 to 5.5 VDC |

*Table 146: Adjusted values for power supply voltage by I/O cable length*

**Technical data and ordering**

For more information on 7-Pin JST I/O cables for Alvium USB cameras, see www.alliedvision.com/en/products/accessories.

# Non-isolated, programmable GPIOs

**I/O cables maximum length**

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

## GPIOs description

The camera has four non-isolated GPIOs that can be configured by software to act as inputs or outputs.

Alvium GPIOs use the push-pull technology to switch the signal level between low and high. For low levels, the signal is "pulled" down towards ground level. For high levels, the signal is "pushed" up towards VCC level.

Alvium GPIOs feature the CMOS push-pull output drivers and Schmitt trigger inputs with an internal pull-up resistor and a filter circuit, shown in Figure 117. The push-pull GPIOs are able to source or sink current from an external pin.

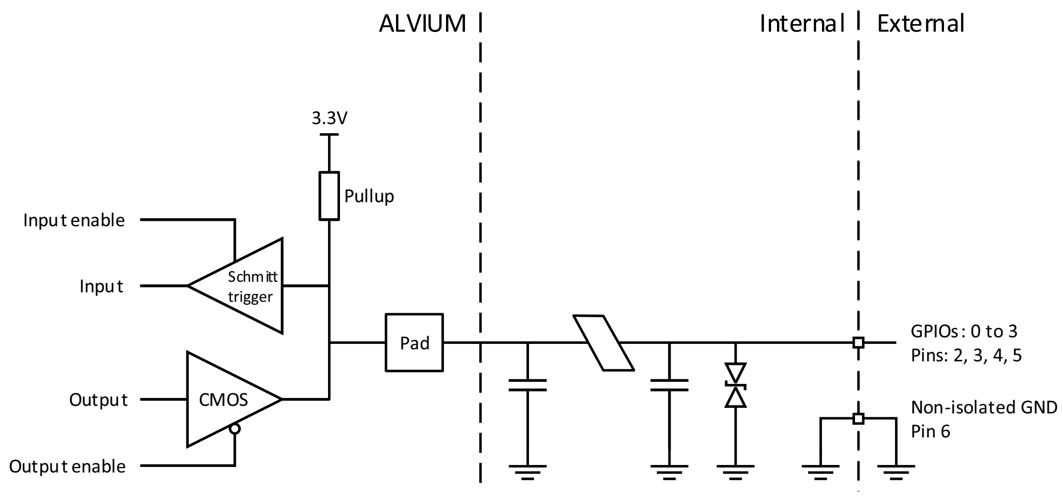



*Figure 117: GPIOs block diagram*

## Input levels

The GPIOs can be connected directly to the system controlling the camera for voltages up to 5.5 VDC. An external resistor is not necessary.

**NOTICE**

**Damage to the camera by high input voltage**

Exceeding maximum input voltage can damage the camera.

Keep maximum input voltage below 5.5 VDC.

| Parameter | Value |
|---|---|
| $U_{in}$ (low) | -0.3 to 0.8 VDC |
| $U_{in}$ (high) | 2.0 to 5.5 VDC |
| Undefined levels | 0.8 to 2.0 VDC |

*Table 147: GPIOs as input, voltage levels*

## Output levels

**NOTICE**

**Damage to the camera by high output current or voltage**

The camera can be damaged when connected to a device that exceeds the specified maximum current or voltage. Consider maximum values:

- Maximum current = 12 mA per output
- Maximum Out VCC = 3.3 VDC

| Parameter | Value |
|---|---|
| External output voltage $U_{out}$ (low) | 0 to 0.4 VDC |
| External output voltage $U_{out}$ (high) | 2.4 to 3.3 VDC |
| Undefined levels | 0.4 to 2.4 VDC |
| Maximum external output voltage | 3.3 VDC |
| Maximum output current | 12 mA |

*Table 148: GPIOs as output, current and voltage levels*

**Output voltage for $U_{Out}$ (high) = On state**

The voltage level in the On state depends on the load current. Higher currents yield lower voltage.

# Status LED

Alvium USB cameras have a **green** status LED. The following table describes the flashing pattern indicating different events. Inverse flashing: If the LED is already on, it is switched off for a short time.

**LED settings**

You can define LED settings with the `DeviceIndicatorLuminance` feature:

- *10* sets maximum LED brightness.
- *1* sets minimum LED brightness.
- *0* disables LED signaling.

## Normal operation

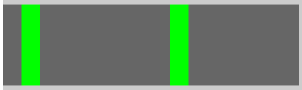
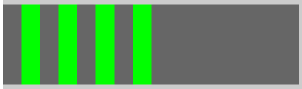
| LED code | Behavior | Status |
|---|---|---|
|  | Continuously active | Power on or idle state |
|  | Irregular flashing | Command or image traffic, such as for camera startup |
|  | Four short flashes and code sequence | Error state |

*Table 149: LED codes for normal operation*

## Error conditions

Four short flashes followed by another sequence indicate errors. In this case, try the following to get the camera back to normal operation:

1. Restart the camera.
2. If the LED indicates error state again, please contact support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

Allied Vision

# Triggering and timings

This chapter includes:

# Trigger signal flow

Figure 118 shows an ideal diagram for the trigger signal flow. The external signal can be a physical source, such as light barrier as hardware trigger or a software trigger. This external signal starts the exposure of a frame. The end of exposure starts the readout. High levels show the active state of a signal.

**Features availability**

States shown in the following graphic apply to Alvium USB cameras. Not all of the corresponding features may be supported. See the Alvium Cameras Features Reference at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation for details.

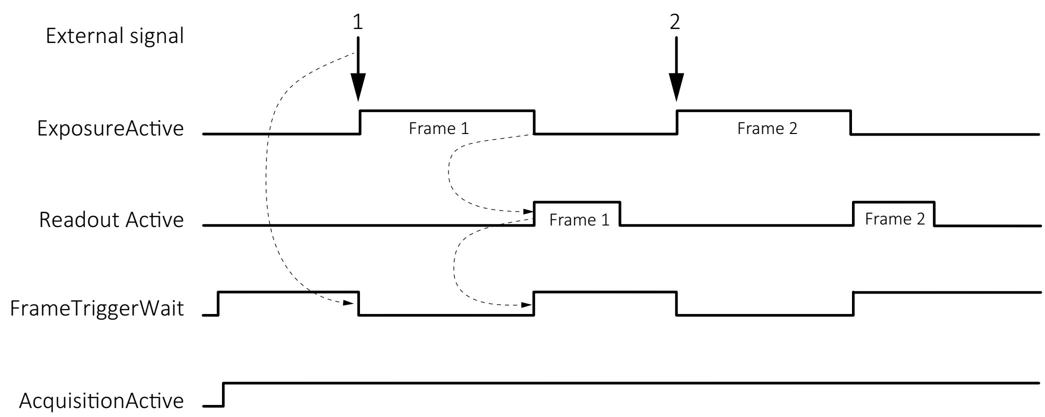



*Figure 118: Schematic trigger signal flow*

| Term | Description |
|---|---|
| External signal | Electrical trigger signal starting the signal flow |
| Exposure Active | Exposing a frame |
| Readout Active | Reading out a frame (logical state, not a user feature) |
| Frame Start Trigger Wait | Waiting for a trigger |
| Acquisition Active | Enables frame acquisition: Expose, read out data, or wait for triggers. |

*Table 150: Trigger signal flow terms*

# Trigger latency

In theory, a trigger creates an immediate response of the camera, depending on the cable length. In practice, the computer may add a delay that is mostly unpredictable, especially on Windows systems. In addition, camera electronics and sensors have a delay.

Rolling shutter (RS) cameras in this document also have exposure delay, depending on camera settings, see Triggering with rolling shutter cameras on page 303.

# Trigger features and UserSetDefault

See Trigger features and UserSetDefault on page 248.

# Trigger delay with 1800 U-120 cameras

If sensor related parameters are changed **directly before** sending an external trigger, the trigger delay can be increased. This relates to Frame rate jitter on page 314.

# Triggering with rolling shutter cameras

Alvium 1800 U-500, -501 NIR,-1240, and -2050

Figure 119 shows how an external signal triggers exposure and readout for cameras with rolling shutter (RS) sensors. Like for global shutter (GS) sensors, readout has a constant duration, acquisition must be active to enable exposure, the end of exposure starts readout.

Rolling shutter (RS) sensors run in cycles where readout area equals exposure area. Overlapping triggering is not supported. If exposure time is shorter than readout time, exposure starts with a delay:

Exposure start delay = exposure area – exposure time.

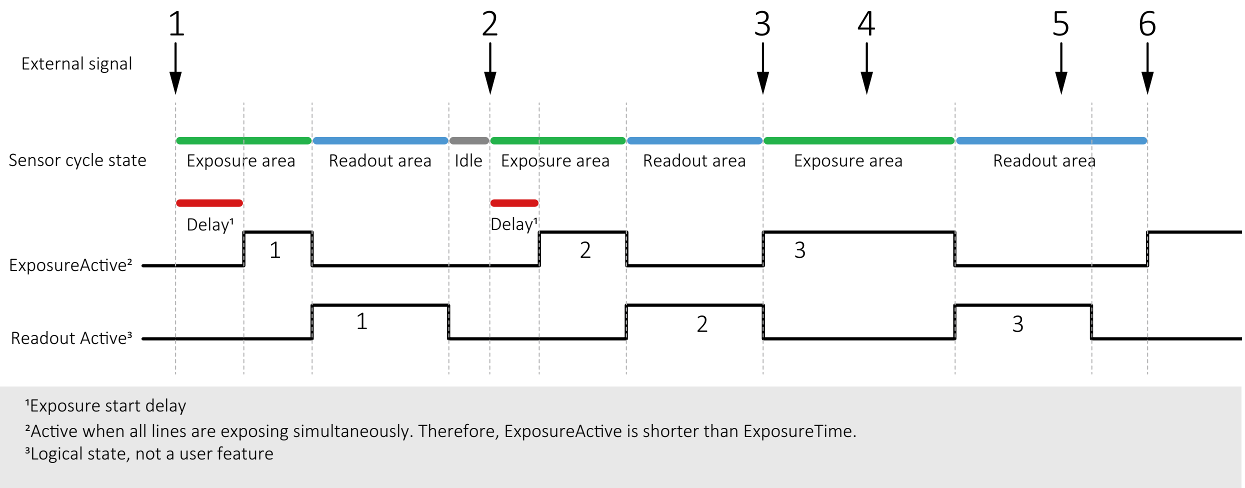



*Figure 119: Triggering rolling shutter (RS) cameras*

| No | Conditions | Results |
|---|---|---|
| 1 | Exposure time is shorter than readout time. | Trigger 1 starts exposure 1 with a delay |
| 2 | Exposure time is shorter than readout time, but **longer** than for exposure 1. | Trigger 2 starts exposure 2 with a delay **shorter** than for exposure 1. |
| 3 | Exposure time is longer than readout time | Trigger 3 starts exposure time without a delay. Because the exposure area is longer, also the readout area is longer than for triggers 1 and 2 |
| 4 | Exposure area is ongoing. | Trigger 4 is ignored. |
| 5 | Readout area is ongoing | Trigger 5 is ignored. |
| 6 | Readout area is finished. Exposure time is longer than readout time. | Trigger 6 starts exposure 6 without a delay |

*Table 151: Triggering conditions and results*

**TriggerSelector values for rolling shutter (RS) cameras**

Cameras with rolling shutter (RS) **can** be triggered using *`AcquistionStart`*, *`AcquisitionEnd`*, or *`FrameStart`* for `TriggerSelector`.

Cameras with rolling shutter (RS) **cannot** be triggered using *`ExposureStart`* or *`ExposureEnd`* for `TriggerSelector`.

**Frame rates in triggered mode**

When rolling shutter cameras are operated in triggered mode, the values for maximum frame rate reached in free run mode are cut in half.

# Ignored triggers

Alvium 1800 U-500, -501 NIR, -1240, and -2050

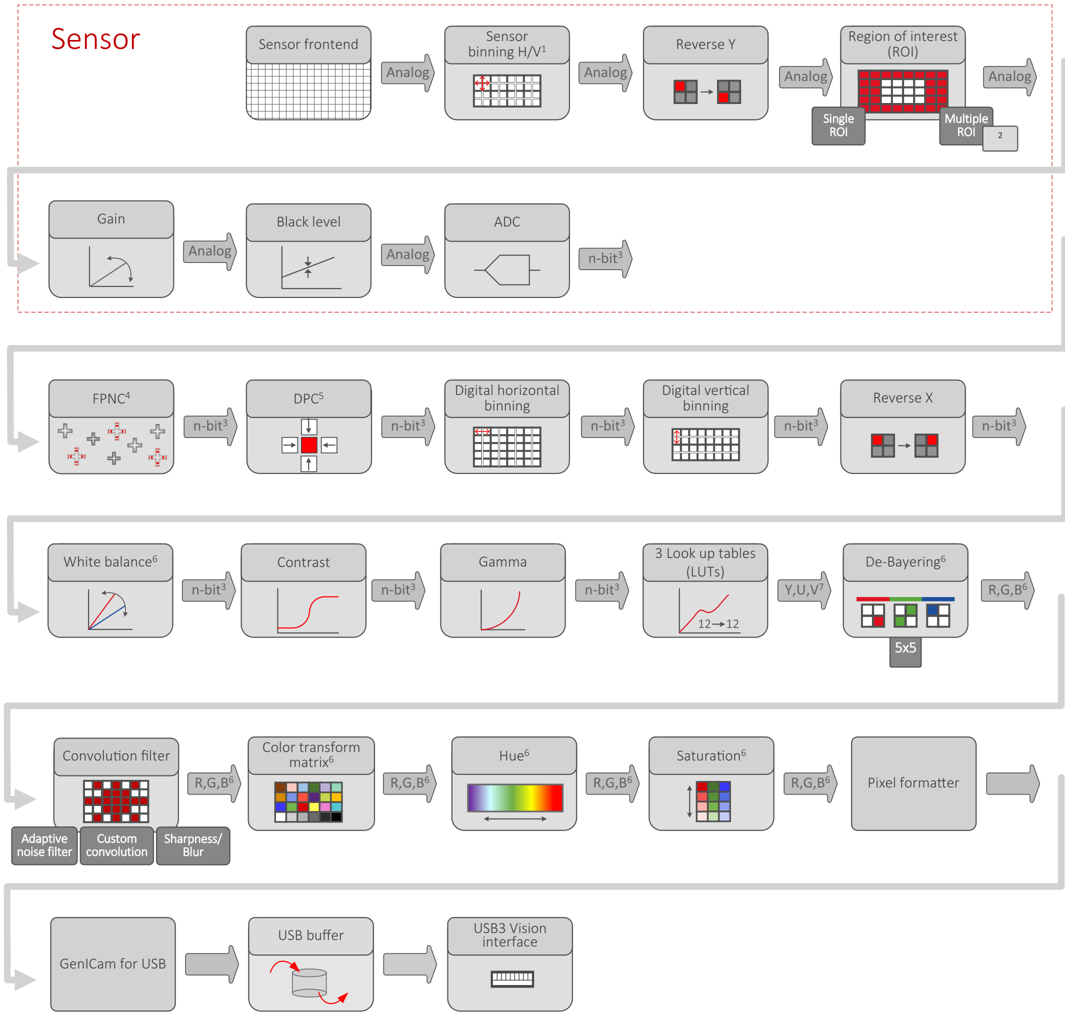
Changing parameters while acquisition is active leads to ignored triggers until the parameters get active.

# Image data flow

This chapter includes:

# Image data flow diagram

Figure 120 shows the order in which the features are **processed** in Alvium USB cameras. See Value changes by feature interdependencies on page 315 for the recommended order to **configure** the camera.




[1] Selected models only: See tables in the Specifications chapter.

[2] Model dependent: See tables in the Specifications chapter.

[3] Model dependent: See ADC bit depths in the Specifications chapter.

[4] Factory preset for FPNC = Fixed Pattern Noise Correction.
See FPNC support on page 307 for supported models.

[5] Factory preset for DPC = Defect pixel correction.

[6] Color models only

[7] For monochrome models: Y only

*Figure 120: Image data flow of Alvium USB cameras*

**Feature descriptions**

The shown functionalities represent features or groups of features that are described in the Alvium Features Reference. See www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation for details.

# FPNC support

Table 152 shows which Alvium 1800 U models support FPNC (Fixed pattern noise correction):

| Alvium model | Sensor | FPNC support |
|---|---|---|
| 1800 U-030 VSWIR | IMX991 | - |
| 1800 U-040 | IMX287 | ✓ |
| 1800 U-050 | P480 | ✓ |
| 1800 U-052 | IMX426 | - |
| 1800 U-120 | AR0135 | ✓ |
| 1800 U-130 VSWIR | IMX990 | - |
| 1800 U-131 | EV76C560 | ✓ |
| 1800 U-158 | IMX273 | ✓ |
| 1800 U-192 | EV76C570 | ✓ |
| 1800 U-203 | IMX422 | - |
| 1800 U-234 | IMX249 | - |
| 1800 U-235 | IMX174 | - |
| 1800 U-240 | IMX392 | ✓ |
| 1800 U-291 | IMX421 | - |
| 1800 U-319 | IMX265 | ✓ |
| 1800 U-320 VSWIR | IMX993 | - |
| 1800 U-500 | AR0521 | ✓ |
| 1800 U-501 NIR | AR0522 | ✓ |

| Alvium model | Sensor | FPNC support |
|---|---|---|
| 1800 U-507 | IMX264 | ✓ |
| 1800 U-507 Pol | IMX264 | - |
| 1800 U-508 | IMX250 | ✓ |
| 1800 U-508 Pol | IMX250 | - |
| 1800 U-510 | IMX548 | ✓ |
| 1800 U-511 | IMX547 | ✓ |
| 1800 U-530 VSWIR | IMX992 | - |
| 1800 U-811 | IMX546 | ✓ |
| 1800 U-812 UV | IMX487 | ✓ |
| 1800 U-895 | IMX267 | - |
| 1800 U-1236 | IMX304 | ✓ |
| 1800 U-1240 | IMX226 | ✓ |
| 1800 U-1242 | IMX545 | ✓ |
| 1800 U-1620 | IMX542 | ✓ |
| 1800 U-2040 | IMX541 | ✓ |
| 1800 U-2050 | IMX183 | - |
| 1800 U-2460 | IMX540 | ✓ |

*Table 152: FPNC availability by camera model*

# Firmware update

This chapter describes how firmware is updated on Alvium USB 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 computer running during firmware updates.
- If the camera is powered down during firmware update, the camera firmware may get into a non-functional state.

**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, see www.alliedvision.com/en/support/firmware.

3. Connect your Alvium camera to the host.
4. Execute the installer of the firmware updater.
   The **Vimba X Firmware Updater** window opens, displaying your camera and the installed firmware version.
5. Continue with Updating the firmware on page 310.

# Updating the firmware

**Screenshots**

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

The screenshots show an Alvium CSI-2 camera, but it applies to all interfaces.

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

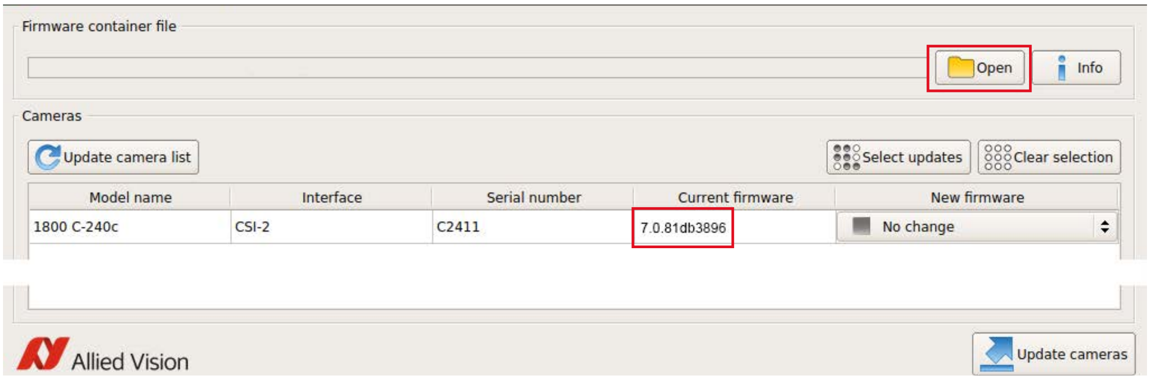



*Figure 122: The camera and installed firmware are displayed*

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

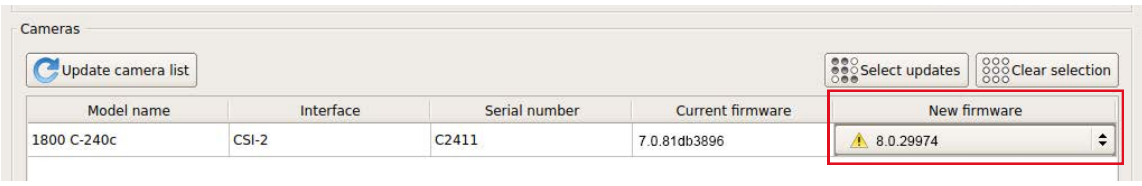



*Figure 123: The firmware version is selected*

3. Click **Update cameras**.


*Figure 124: The update is being prepared*

4. Click **OK** to confirm.


*Figure 125: The command to update the firmware is confirmed*

The update progress is displayed.

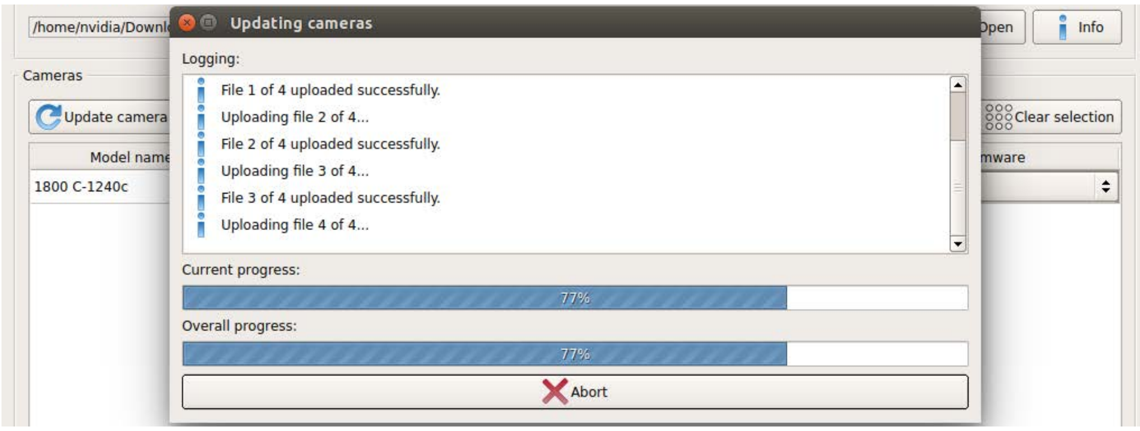



*Figure 126: The update progress is displayed*

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

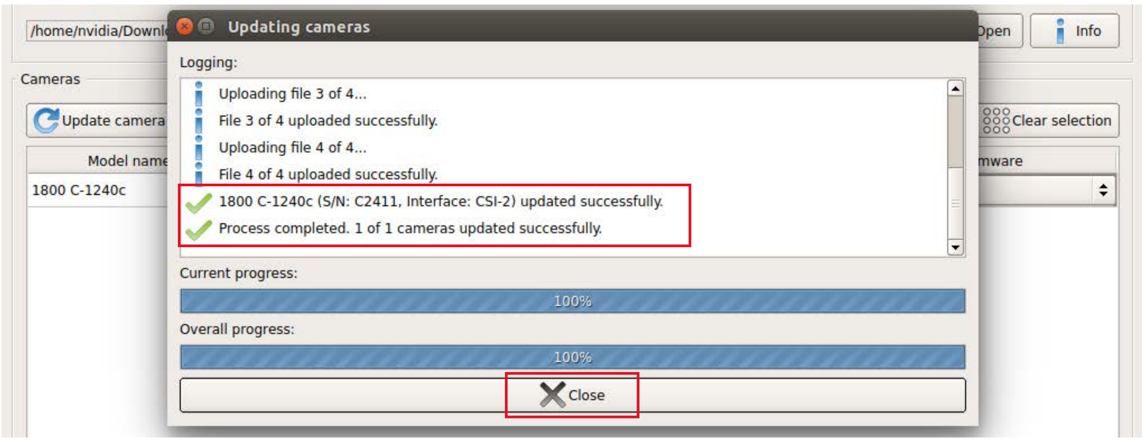



*Figure 127: The update has been successfully completed*

The camera is displayed with the updated firmware version.

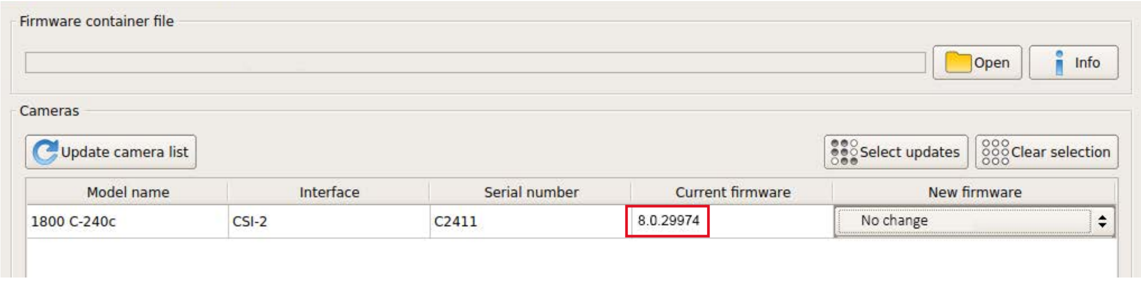



*Figure 128: The updated firmware version is displayed*

# Error handling

If firmware update fails,

- The camera is shown as “Fallback” on the USB bus.
- The camera is not recognized by **Vimba X Viewer**.
- You can repeat the firmware update.

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

# Performance and troubleshooting

This chapter includes:

# Optimizing performance

## Image transfer with rolling shutter cameras

Alvium 1800 U-500m/c, U-501m NIR, U-1240 m/c, and U-2050m/c

If acquisition is started and stopped in a short sequence, no image is transferred to the host. The duration cannot be predicted, because it depends on various factors.

## Parameter changes

If parameters are changed while these cameras are streaming, the following effects can occur.

### Stopped streaming

Alvium 1800 U-500, -501 NIR, -1240, and -2050

When `AcquisitionMode` set to ***`MultiFrame`***: If cameras are triggered by `AcquisitionStart`, the streaming stops when parameters are changed.

For ***`MultiFrame`*** acquisition, we recommend to you stop streaming before you change parameters.

### Frame rate jitter

Alvium 1800 U-120, -500, -501 NIR, -1240, and -2050

Generally, some parameters can be changed during exposure without affecting the timing. For models with ON Semiconductor AR sensors and rolling shutter sensors, a different behavior must be considered for **camera operation in freerun mode without triggering**:

Changing parameters during exposure leads to frame rate jitter. When parameters are entered, the next frame starts only after readout and sensor reconfiguration delay are finished. When the camera is run in `ExposureAuto` mode, the actual frame rate is less than the calculated value for the corresponding exposure time. Consider frame rate jitter for your application, including a gap between `ExposureActive` signals.

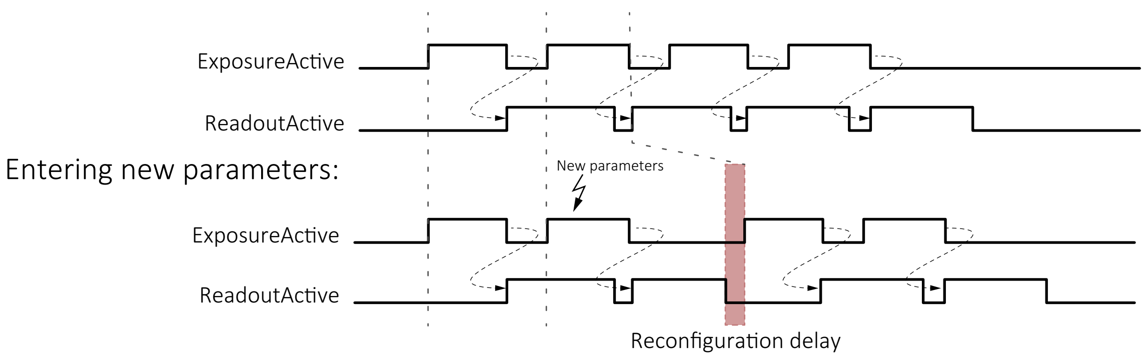



*Figure 129: Delayed exposure due to parameter changes*

**Parameter changes in triggered mode**

See Ignored triggers on page 304 for more information.

# Value changes by feature interdependencies

The conversion between time and clock cycles affects control values. Features for pixel format, bandwidth, ROI, exposure time, and triggering are related to each other. Changing values for one feature can change values for another feature. For example, frame rates can be reduced when `PixelFormat` is changed subsequently. Figure 130 shows the interdependencies.

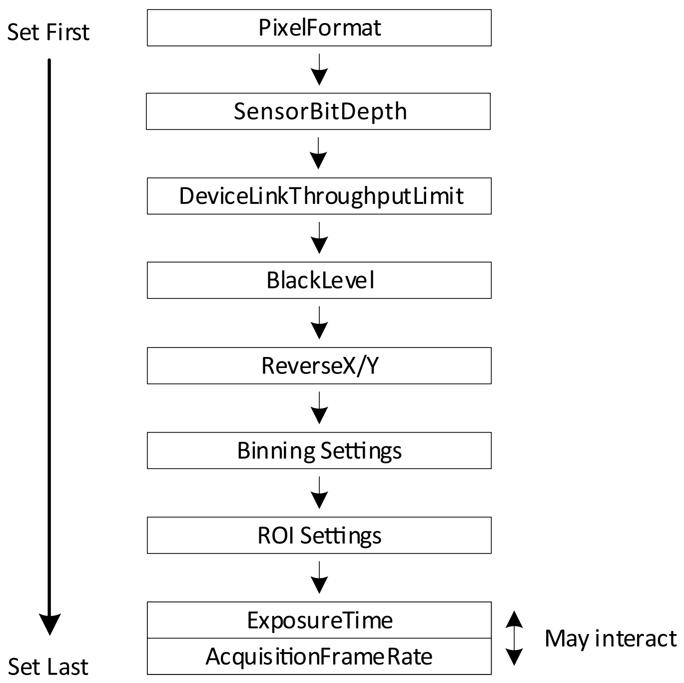



*Figure 130: Interdependencies between features*

## Effects for the interdependent features

Changing one control's value affects other control's values, such as:

If: `Height` value is changed.

Then: Other values may be affected, such as for `AcquisitionFrameRate` and `ExposureTime`.

We recommend you to consider:

- The more features you adjust, the more current values deviate from previously set values.
- The same effects that apply to `ExposureTime`, also apply to `AutoExposure`.
- To avoid readjustments, apply settings in the order shown in Figure 130.

### Impact by other features

| Input | Output | |
|---|---|---|
| | Exposure time values | Frame rate |
| `AcquisitionFrameRate` | Not affected | Affected |
| `ExposureTime` | Affected as expected | Affected |
| `DeviceLinkThroughputLimit` | Affected | Affected |
| `Height` | Not affected | Affected |
| `Width` | May be affected | May be affected |

*Table 153: Impact by other features*

### Exposure times and frame rates with Sony IMX rolling shutter cameras

Alvium 1800 U-1240 and -2050

Generally, long exposure times result in low frame rates because one is roughly the inverse of the other. With Alvium IMX RS cameras:

- The range of available frame rates depends on the exposure time.
- The exposure time must be increased when low frame rates are used.
- The available range for frame rate values depends on the exposure time. If by changing the exposure time, the previous frame rate is moved out of the available range, the frame rate is adjusted automatically.

## Dark current compensation

All sensors accumulate dark current in the pixels. Dark current increases the signal level and black level. Most sensors in Alvium USB cameras compensate for this.

For **Alvium 1800 U-050m/c** with the ON Semi PYTHON 480 sensor, see Black level compensation for 1800 U-050m/c on page 318.

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.

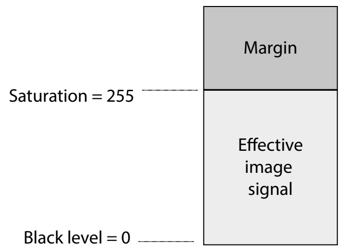
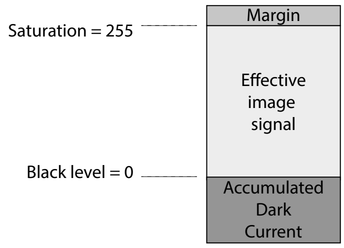
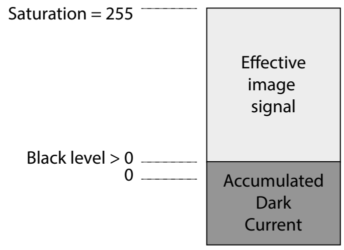
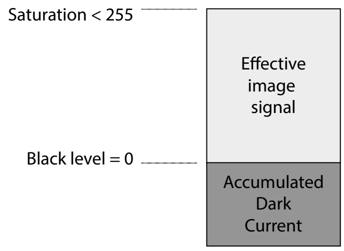
<table>
<tr><th>Effective signal versus noise</th><th>Description</th></tr>
<tr><td>
</td><td>The pixel has accumulated no dark current, the margin has maximum size.</td></tr>
<tr><td>
</td><td>The pixel has accumulated some dark current, reducing the size of the margin.</td></tr>
<tr><td colspan="2">The following images show a pixel that has accumulated a higher dark current than the margin.</td></tr>
<tr><td>
</td><td>The pixel has accumulated dark current, the margin reduces to 0.<br>Type 1 compensation<ul><li>Dark current compensation is stopped.</li><li>Dark current increases the black level.</li><li>Fixed pattern noise increases.</li></ul></td></tr>
<tr><td>
</td><td>The pixel has accumulated dark current, the margin reduces to 0.<br>Type 2 compensation<br>(Typically used for sensor-internal compensation, often in the analog domain.)<ul><li>Dark current compensation stays active.</li><li>Maximum saturation signal decreases.</li><li>Fixed pattern noise increases.</li></ul></td></tr>
</table>

*Table 154: 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?

### Measures for type 1 compensation

**Alvium 1800 U-050m/c** supports compensation type 1. For additional compensation, see Black level compensation for 1800 U-050m/c on page 318.

Typically, there is no measure to improve the image signal.
The rising black level shifts black and dark gray values to gray.

### Measures for type 2 compensation

All other Alvium camera models support compensation type 2.

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.

## Black level compensation for 1800 U-050m/c

Because the ON Semi PYTHON 480 sensor does not have a dark current compensation, **Alvium 1800 U-050m/**c cameras have a typical black level value drift, depending on exposure time and `DeviceTemperature` (measured at the mainboard). Table 155 shows the effect of the black level compensation. Should additional compensation be needed, we recommend cooling the camera.

| **Temperature [°C]** | **ExposureTime [ms]** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **10** | **50** | **100** | **250** | **500** | **750** | **1,000** |
| **35** | | | | | | | | |
| **40** | | | | | | | | |
| **45** | | | | | | | | |
| **50** | | | | | | | | |
| **55** | | | | | | | | |
| **60** | | | | | | | | |
| **65** | | | | | | | | |
| **70** | | | | | | | | |
| **75** | | | | | | | | |

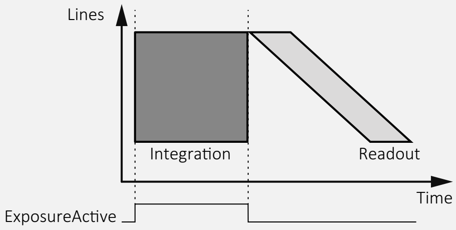
Full compensation

Partial compensation

*Table 155: Exposure time and temperature affecting black level compensation*

# Shutter types affecting image readout

Most Alvium USB camera models are operated using global shutter (GS):

| Property | Line readout | Moving image |
|---|---|---|
| Global shutter (GS) |  |  |

Alvium 1800 U-500 and -501 NIR models use rolling shutter (RS).
Alvium 1800 U-1240 and 1800 U-2050 models offer global reset shutter (GRS) in addition:

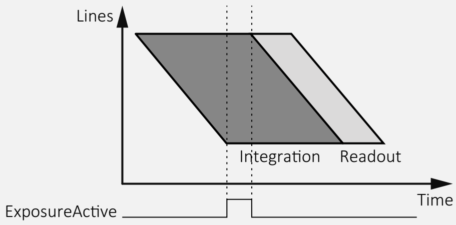
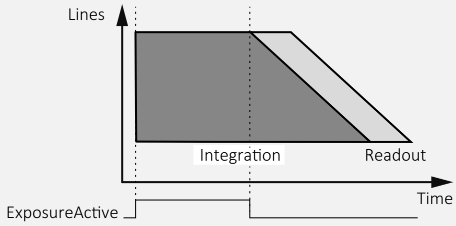
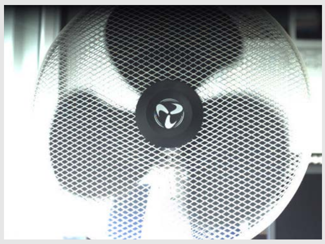
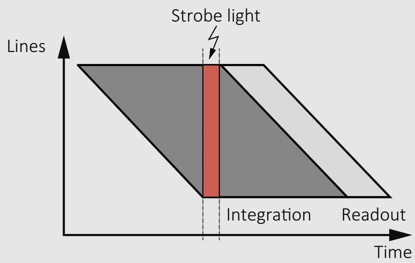
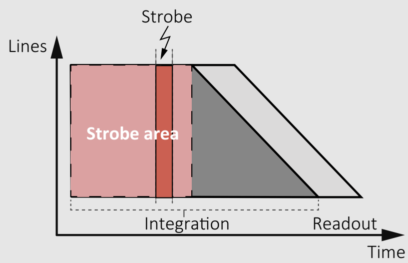
| Property | Rolling shutter (RS) | Global reset shutter (GRS) |
|---|---|---|
| Line readout |  |  |
| Line exposure start | Deferred from line to line | Common for all lines |
| Line exposure time | Common for all lines | Increases from line to line |
| Image acquisition of moving objects |  |  |
| Image brightness | Constant over the image | Varying over the image |
| Moving objects | Distorted shape | Shape without distortion |
| Typical application | Static objects | Moving objects |
| Compensation | Use an additional mechanical shutter or use a strobe light:<br> |  |

*Table 156: Shutter types affecting image readout*

# Host setup 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.

## Sensor data output and camera data output

For cameras with an image buffer, the required bandwidth for image acquisition can be estimated for a given frame rate, pixel format, and resolution by over-the thumb calculations. Alvium cameras do not have an image buffer.

Figure 131 shows the bandwidth for a higher (1) and a lower (2) value for `DeviceLinkThroughputLimit`.

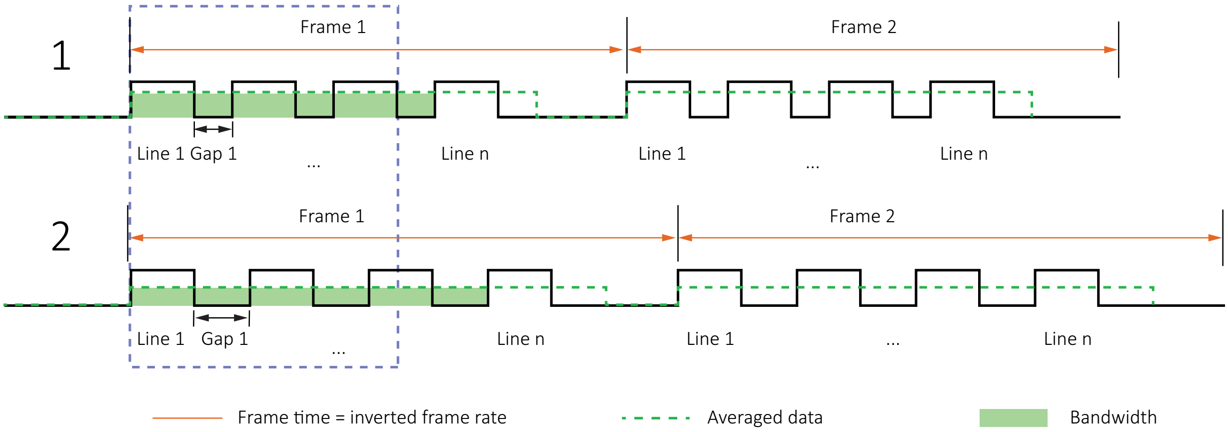



*Figure 131: Sensor data output and camera data output*

- Cameras **without** an image buffer like Alvium: Data is averaged over the line time.
- Cameras **with** an image buffer: Data rate is averaged over the frame time.
- Using `DeviceLinkThroughputLimit`: Reduce the maximum line data rate.

`DeviceLinkThroughputLimit` controls the maximum bandwidth of the data streamed out by the camera. When the value for this feature is reduced, the gaps between the lines are increased. This reduces the frame rate and therefore the bandwidth.

Additionally, you may reduce the frame rate to reduce bandwidth.

Consider that **Vimba X Viewer** does not gray out values that exceed the bandwidth supported by the host computer.

**More information on DeviceLinkThroughputLimit**

For more information on `DeviceLinkThroughputLimit`, see the Alvium Cameras Features Reference at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

## Vimba X settings

During freerun, Alvium cameras do not automatically adapt the frame rate to the USB controller's limits. If the data rate is too high for your USB controller, it receives corrupted frames. The image transfer status in **Vimba X Viewer** is signaled as **Running**. However, the corrupted frames are not displayed.

## Requirements for USB PCIe cards and host controllers

Ensure sufficient bandwidth is supported by the USB host adapter cards **and** by the corresponding USB PCIe host controllers on your host system. 450 MByte/s are required to reach maximum frame rates for some Alvium USB camera models. Adding the typical overhead for USB communication, even 500 MByte/s can be insufficient. We recommend using roughly **1 GByte/s per camera**.

In Table 157 you can see that, for example, Version 1.1 PCIe host controllers with 1 lane do not support the bandwidth required to operate a single camera at full performance.

| **Lanes ↓** | **Throughput** | | |
|---|---|---|---|
| **PCIe version →** | **1.0 / 1.1** | **2.0 / 2.1** | **3.0 / 3.1** |
| × 1 | 250 MByte/s | 500 MByte/s | 0.99 GByte/s |
| × 2 | 500 MByte/s | 1 GByte/s | 1.97 GByte/s |
| × 4 | 1 GByte/s | 2 GByte/s | 3.9 GByte/s |

*Table 157: Requirements for USB PCIe host adapters*

### Potential limitations with 4-port cards

Observe that some 4-port PCIe cards have limitations: They use shared resources and do not support the required bandwidth when each port is used.

**Suitable USB 3.0 accessories**

See www.alliedvision.com/en/products/accessories for suitable USB 3.0 or 3.1 Gen 1 host controller cards and cables or contact your Allied Vision Sales representative.

# Shared bandwidth on a common USB bus

## Ideal setup for two cameras

### Preconditions

- Control traffic is ignored.
- The possibility of the host being busy with other tasks is ignored.
- Cameras share 100% bus bandwidth.
- Cameras need 100% bus bandwidth in total.
- Cameras stream in the same way because they are the same model and have identical settings.
- No other device is connected.

### Result

- Bandwidth is divided by two, cameras get assigned 50% bandwidth each.
  For three cameras, the bandwidth is 33.3% each.
- If one camera sends no data, the other camera will be assigned 100% bandwidth. To always assign 50% to both cameras, they have to be controlled to use no more than 50% bandwidth each.
- If the computer cannot process the images received from a camera, images are corrupted.

## Best practice for bandwidth management

- To assign maximum bandwidth to a camera, make sure your camera is the only device on the bus.
- Avoid devices, such as a monitor or a mouse, sharing bandwidth with the USB camera connected to the same bus.
- For maximum bandwidth, use a current version host controller card.
  See www.alliedvision.com/en/products/accessories.
- USB3 Vision devices use bulk transfer. Avoid using other transfer modes.
- Control bandwidth by assigning the desired amount to the separate cameras.

## Cascading hubs divide bandwidth

The following example applies to standard behavior without individual settings. The graphics show bandwidth distribution on a common bus. Three cameras try to use full bandwidth at the same time. If one camera is inactive, the host will provide its share to the others until this camera sends data again. See Figure 132 on page 322.

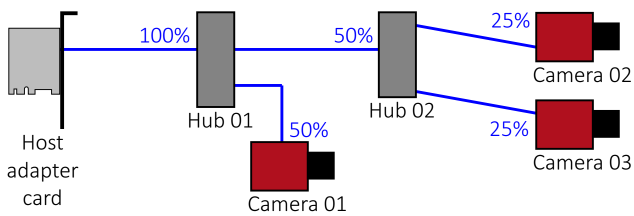



*Figure 132: Bandwidth assignment for cascading hubs*

# DevicePowerSavingMode

If you want to pause camera operation, you can use `DevicePowerSavingMode` to reduce the power consumption of Alvium USB cameras.

For example, with *SuspendMode* (**U3 mode**), the remaining power consumption is approximately 0.1 W. With *StandbyMode*, the remaining power consumption is approximately 1.1 W (with external power as well as with USB Power) for all models.

In this section, you learn to change between operational mode and U3 mode by `DevicePowerSavingMode` and host or backend commands.
The `DevicePowerSavingMode` feature selects between standard power use and various power saving modes, avoiding unexpected camera behavior:

| Values | Description |
|---|---|
| *Disabled* | The camera uses standard power (default). |
| *StandbyMode* | Camera functions are disabled to reduce power consumption. However, the control channel is maintained active: the camera can still be controlled by GenICam features. |
| *SuspendMode* **Recommended with Linux**. | The camera is enabled to go into USB U3 power saving mode. The Phy shuts the camera down. The host must send a `DevicePowerSave` command or a respective backend command to the camera to apply *SuspendMode*. The camera reboots itself. After reboot, all camera settings are reset to default values, `DevicePowerSavingMode` is reset to *Default*. |

*Table 158: Options for DevicePowerSavingMode*

**Please observe**

The U3 mode is not supported for USB 2.x connections.

**Using power saving modes**

**StandbyMode**

Use `DeviceReset` command to switch from *StandbyMode* back to *Disabled* for standard power mode.

**SuspendMode**

- Using SuspendMode under Linux on page 324
- Using SuspendMode under Windows on page 325

## Using SuspendMode under Linux

### Activating U3 mode

1. Connect to the camera and use as you like.
2. Set `DevicePowerSavingMode` to *SuspendMode*.
3. Close all **Vimba X** connections, including the first **Vimba X Viewer** dialog.

Linux requires to change the following settings to bring a USB device to U3 mode:

- power/control => auto
- power/autosuspend_delay_ms => 0

The following script to put the camera to U3 mode can be used on most hosts.

4. Execute this script with root privileges. For example, save this script as **U3.sh** and use the command `sudo ./U3.sh`:

```
#!/usr/bin/env bash

# https://www.kernel.org/doc/html/v4.13/driver-api/usb/power-
management.html#the-user-interface-for-dynamic-pm
find -L /sys/bus/usb/devices/ -maxdepth 2 -regextype posix-
extended -regex '/sys/bus/usb/devices/[0-9]+\-[0-9]+' | while
read port; do
    if [[ $(< $port/idVendor) == "1ab2" ]]; then
        if [[ $1 == on ]]; then
            echo "Activating port: $port"
            echo on > $port/power/control
            echo 2000 > $port/power/autosuspend_delay_ms
        else
            echo "Suspending port: $port"
            echo auto > $port/power/control
            echo 0 > $port/power/autosuspend_delay_ms
        fi
    fi
done
```

*Code Listing 1: Linux script to change to U3 mode*

### Reactivating operational mode

Open **Vimba X Viewer**.

The camera boots up. This may take about 2 seconds.

## Using SuspendMode under Windows

### Activating U3 mode

1. Connect to the camera and use as you like.
2. Set the `DevicePowerSavingMode` to *SuspendMode*.
3. Close all **Vimba X** connections, including the first **Vimba X Viewer** dialog.
4. In the **Device Manager**, click **Disable Device** for the Allied Vision USB3 Vision Device:

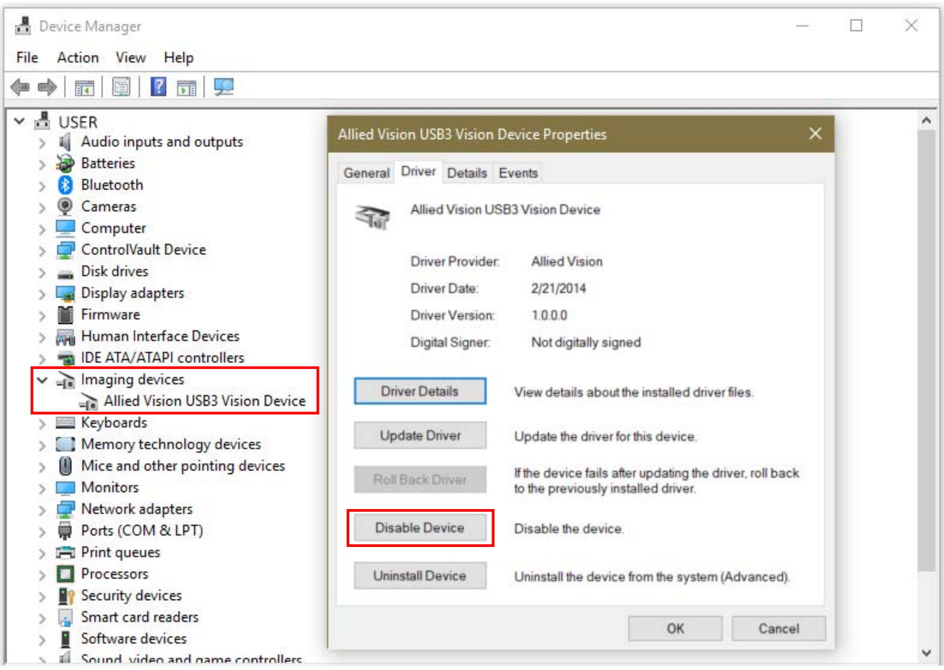



*Figure 133: Disabling the Alvium camera in the Device Manager*

### Reactivating operational mode

1. In the **Device Manager**, click **Enable Device** for the Allied Vision USB3 Vision Device:

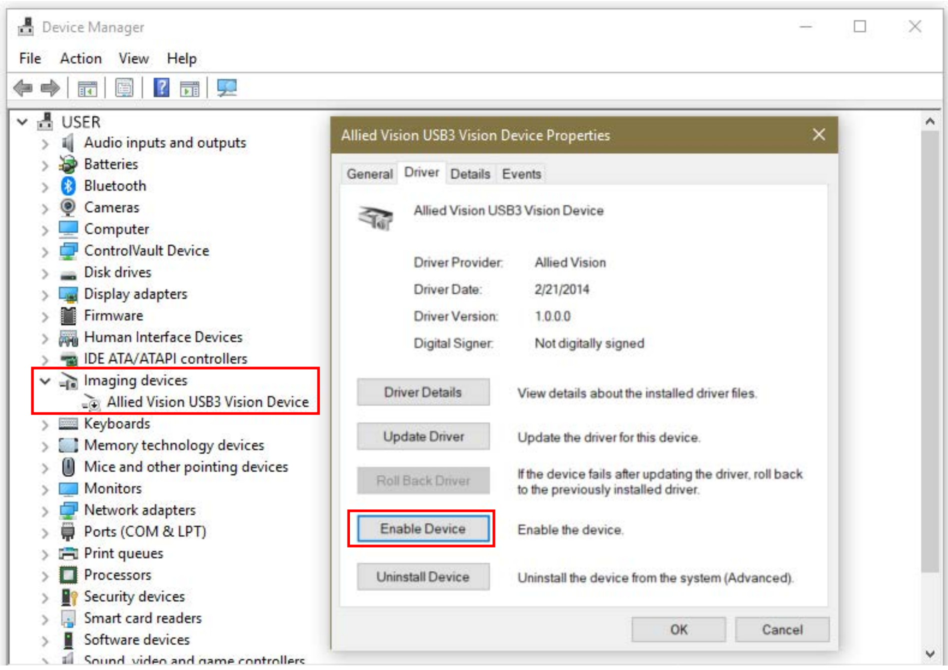



*Figure 134: Enabling the Alvium camera in the Device Manager*

2. Open **Vimba X Viewer**.

The camera boots up. This may take about 2 seconds.

# Power consumption issues

The power consumption of cameras is caused by such as the image sensor and enabled features. The total power for the host system also includes the USB cable loss. Unfavorable setups can prevent your system from working. What can you do?

## Ensure sufficient power supply

Your host system must provide sufficient voltage and current at the USB downstream connector on the host system for proper camera operation. If this is not the case, we recommend you to power cameras by an external power supply, using the I/O connector (see Camera interfaces on page 289 for details).

### Reduce the power consumption

This applies **only if cameras are powered via USB**. When Alvium USB cameras begin to exceed the maximum current allowed by the USB 3.0 standard, cameras are automatically shut down.

Some features increase the power consumption:

- `ConvolutionMode`
- `SensorBitDepth`

Try not to use these features at the same time to reduce the power consumption.

**Support**

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

# Troubleshooting common issues

In this section you can find questions and answers about problems with camera operation. The events are ordered from general to detail:

- Camera recognition
- Unexpected events
- Performance
- Radio signal interference

Each entry consists of:

- Observed unwanted event, numbered for easier handling
- Short description of the solution
- Step-by-step instructions to resolve the issue.

**Hardware installation**

For background information, see Installing the camera on page 269.

# Camera recognition

**How can I make the computer and Vimba X Viewer recognize the camera?**

**1.** Check if the **hardware** supports your USB camera.

Is the power supply sufficient to operate the camera? See Power consumption issues on page 326.

See www.alliedvision.com/en/products/accessories.

**Windows only**

**2.** Check if your computer has an appropriate **USB 3.0 or 3.1 Gen 1 host controller driver** installed.

**Windows 8 and later OS** provide a USB 3.0 or 3.1 Gen 1 host controller driver. On a properly installed OS, no problems should occur.

**Windows 7 and earlier OS** do not provide a USB 3.0 or 3.1 Gen 1 host controller driver.
To install the host controller card:

Download the manufacturer USB 3.0 or 3.1 Gen 1 host controller driver.
Install the driver on your computer.

Result: The installed driver enables the host controller.

**Windows only**

**3.** Check if the **USB3 Vision device driver** is properly installed and assigned to the camera.

Follow the instructions in Installing the host adapter and Vimba X on page 284.

**4.** The camera, **connected to a USB 3.0 or 3.1 Gen 1 hub**, is not recognized anymore. Check if the USB 3.0 or 3.1 Gen 1 hub has crashed.

1. Disconnect the USB and power supply cable from the hub.
2. Reconnect both.

Result: The camera is recognized again.

**5.** The camera, **connected directly to the computer**, is not recognized anymore. Check if a hub included in the **USB host controller** has crashed.

1. In the **Device Manager**, deactivate the host controller.
   For **Windows**, see Installing the camera driver with Windows tools on page 287.
2. Reactivate the host controller.

Result: The camera is recognized again.

# Unexpected events

**How do I get the camera back to normal operation?**

**1.** Check if the **camera is active**.

If: The camera is shut down after changing feature settings.

Then: Restart the camera with previous feature settings used before the changes. Read how to Reduce the power consumption on page 327.

**2.** Check if an error is shown by the **camera** Status LED.

If: The status LED signals four short flashes followed by another sequence.

Then: Restart the camera.

If: If the status LED again signals four flashes.

Then: Please contact support at www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

**3.** Check if **power cables**, such as cables with a high current in the environmental setup, **harmfully interfere with camera cables**.

If: Any camera cable crosses or goes parallel with a power cable.

Then: Separate camera cables from power cables.

**4.** Make sure the **camera is intact**.
For this, exclude issues of the cable or the connected computer:

1. Connect the camera with a **different cable** to a **different computer**.

If: The camera works properly.

Then: The camera is intact, but your previous computer or cable has a defect. Continue with 2.

If: The camera does not work properly.

Then: Most likely, the camera has a defect. Please contact Allied Vision support.

2. Connect the camera with the **previous cable** to the **different computer**.

If: The camera works properly.

Then: Replace the cable.

3. Connect the camera with the **replaced cable** to the **previous computer**.

If: The camera does not work properly.

Then: Check the computer to fix the issue.

**Why does the camera not transfer images?**

**1.** The value for `DeviceLinkThroughputLimit` is set higher than the bandwidth supported by the host system.

Then: Check if sufficient bandwidth is assigned to the camera. See Host setup and bandwidth on page 320.

**2.** The camera is **connected to a USB 2.0 port** and requires a bandwidth higher than 50 MByte/s.

Then: Connect the camera to a USB 3.1. Gen 1 port.

# Performance

**How can I improve camera performance?**

**1.** Check if the **hardware** sufficiently supports your USB camera.

See www.alliedvision.com/en/products/accessories.

**2.** Check if the **USB host adapter card and the USB PCIe host controller** support the available bandwidth.

See Requirements for USB PCIe cards and host controllers on page 321.

**3.** Check if the **camera shares the bus with other devices** reducing the available bandwidth.

Connect the camera to an individual bus, not shared by other devices.
For more information, see Shared bandwidth on a common USB bus on page 322.

**4.** Check if the **camera is connected to cascading hubs**, reducing the available bandwidth.

Attach devices directly to a separate USB 3.0 or 3.1 Gen 1 bus. If you want cameras to share a common bus, use only a single hub to attach devices. For more information, see Shared bandwidth on a common USB bus on page 322.

**5.** Check if all your USB **accessories support USB 3.0 or 3.1 Gen 1**.

For recommended USB accessories, see www.alliedvision.com/en/products/accessories.

# Radio signal interference

**How can I avoid radio signal interference from wireless devices?**

Ensure camera installation complies with **Electromagnetic Compatibility**.

Wireless devices and USB 3.0 or 3.1 Gen 1 commonly use 2.4 GHz frequency (WLAN includes 2.4, 3.6, and 4.9 GHz).

Even USB 3.0 and 3.1 Gen 1 cables can interfere harmfully with other electromagnetic devices. For example, despite shielding, a USB 3.0 or 3.1 Gen 1 cable can interfere with a wireless mouse. Tests have shown an increase of the noise floor up to 20 dB for the affected devices.

- To enable maximum bandwidth, 2.4 GHz radio frequencies must be avoided; therefore, use **maximum shielded cables only**.
- Keep **maximum distance** between your Alvium USB camera setup and interfering devices.
- Use **high-gain antennas** to reduce power of the radio signals.

For tested USB accessories, see www.alliedvision.com/en/products/accessories.

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