Allied Vision

USB3 Vision Cameras

Alvium USB Cameras

User Guide

V3.7.1

FW 00.10.00.6c9062b1

Quick links

- Alvium USB cameras at a glance on page 14
- Contact us on page 17
- Contents on page 18

Read before use

EN - English

Safety

Before using the camera, read these safety instructions. Observe the warnings at all times. Use the camera only as stated in the Intended use on page 41.

CAUTION

Risk of burns

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

CAUTION

Injury by falling cameras or lenses

A falling camera or lens can cause injury.

CAUTION

Risk of cuts by sharp edges of lens mounts

The threads of the lens mount can have sharp edges.

Intended use

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

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 41.

FORSIGTIG

Forbrændingsfare

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

FORSIGTIG

Kvæstelser, hvis kameraet eller linser falder ned

Falder kameraet eller linsen ned, kan dette forårsage kvæstelser.

FORSIGTIG

Fare for snitsår på linsemodulets skarpe kanter

Linsemodulets gevind kan have skarpe kanter.

Tilsigtet brug

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

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 41.

VORSICHT

Gefahr von Verbrennungen

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

VORSICHT

Verletzung durch fallende Kameras oder Objektive

Eine fallende Kamera oder ein fallendes Objektiv kann Verletzungen verursachen.

VORSICHT

Schnitte durch scharfkantige Objektivgewinde

Objektivgewinde können scharfe Kanten haben.

Bestimmungsgemäßer Gebrauch

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

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 41.

ATENCIÓN

Riesgo de quemaduras

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

ATENCIÓN

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

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

ATENCIÓN

Riesgo de cortes debido a los bordes afilados del objetivo

Las roscas de los objetivos pueden tener bordes afilados.

Uso previsto

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

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 41 kuvatulla tavalla.

HUOMIO

Palovammojen vaara

Käytössä olevan kameran saavuttamat lämpötilatasot voivat aiheuttaa palovammoja.

HUOMIO

Putoavien kameroiden tai linssien aiheuttamat vammat

Putoava kamera tai linssi voi aiheuttaa vammoja.

HUOMIO

Linssien kiinnikkeiden terävien reunojen aiheuttamien viiltovammojen vaara

Linssin kiinnikkeiden kierteiden reunat voivat olla teräviä.

Käyttötarkoitus

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

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 41.

ATTENTION

Risque de brûlures

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

ATTENTION

Blessures en cas de chute de caméras ou d'objectifs

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

ATTENTION

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

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

Utilisation prévue

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

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.

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 41.

ATTENZIONE

Pericolo di ustioni

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

ATTENZIONE

Lesioni dovute alla caduta di telecamere o lenti

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

ATTENZIONE

Pericolo di tagliarsi sui bordi affilati degli attacchi della lente

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

Uso previsto

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

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 41 ページの通りに、本カメラを使用してください。

注意

やけどの危険性

作動中のカメラは、やけどを引き起こす温度まで熱くなる恐れがあります。

注意

カメラまたはレンズの落下によるけが

カメラまたはレンズが落下すると、けがをする恐れがあります。

注意

レンズマウントの鋭利な端部で切り傷の危険性

レンズマウントのギザギザの部分が鋭利である可能性があります。

用途

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

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 41.

VOORZICHTIG

Risico van verbranding

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

VOORZICHTIG

Letsel door vallende camera's of lenzen

Een vallende camera of lens kan letsel veroorzaken.

VOORZICHTIG

Risico van snijwonden door scherpe randen van lensbevestigingen

Het schroefdraad van de lensbevestiging kan scherpe randen hebben.

Beoogd gebruik

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

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 41.

FORSIKTIG

Risiko for brannskader

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

FORSIKTIG

Skade ved fallende kameraer eller linser

Et fallende kamera eller en fallende linse kan forårsake skade.

FORSIKTIG

Risiko for kutt fra skarpe kanter på linsefester

Sporene på linsefestet kan ha skarpe kanter.

Tiltenkt bruk

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

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 41.

VARNING

Risk för brännskada

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

VARNING

Risk för skador från fallande kameror eller objektiv

Fallande kameror eller objektiv kan förorsaka skador.

VARNING

Risk för skärsår från vassa kanter på objektivfattningar

Objektivets gängor kan ha vassa kanter.

Avsedd användning

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

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 41 页 .

注意事项

烫伤风险

相机操作过程中温度可能上升并导致烫伤风险。

注意事项

相机或者镜头跌落造成伤害

相机或者镜头可能会跌落并造成伤害。

注意事项

镜头接口的锐利边缘划伤风险

镜头接口螺纹边缘可能较为锐利。

预期用途

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

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:

Read this document carefully

Learn to avoid damage to your Alvium USB camera and use it in the most safe and efficient way.

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 54
- Alvium USB properties: Performance and troubleshooting on page 229
- User sets on page 180, including supported features and trigger features
- Reducing the power consumption: Using the U3 mode on page 239
- Bare board cameras on page 198

Specifications status

- Alvium 1800 U-235 and 1800 U-812 UV models will be released next.
- Alvium 1800 U-234 models will be released later.

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	
Vimba Suite for Windows, Linux, and Linux/ARM, including **Vimba SDK**, **Vimba Viewer**, and **Vimba Driver Installer** for Windows	www.alliedvision.com/software
Firmware downloads	www.alliedvision.com/en/support/firmware-downloads
STEP files	Find downloads for your Alvium model at www.alliedvision.com/en/camera-selector
Accessories, such as interface cables and cards, power and I/O cables, power supplies, lenses, and tripod adapters	www.alliedvision.com/en/support/accessory-documentation
Alvium Accessory Guide	www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation

Table 1: Downloads for Alvium USB cameras

Contact us

Website, email

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

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

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

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Contents

Document history and conventions

This chapter includes:

Document history

Version	Date	Remarks
V3.7.1	2022-Jul-22	• Added values for minimum and maximum exposure times in Alvium 1800 U model specifications on page 58. • Corrected dimensions for screws from M2 to M1.6 in Mounting bare board cameras on page 201.
V3.7.0	2022-Jul-14	**Firmware version**: 00.10.00.6c9062b1 • Added Camera identification on page 38, including Model ID for DoC assignment. • Added symbol for South Korean KC Safety Certification in Compliance notifications on page 38. • Updated data in Specifications on page 49 for: - ROI frame rates and exposure time ranges - Maximum gain for Sony IMX global shutter cameras increased to 48 dB - Exposure Mode of various models. • Added 1800 U-234m/c, 1800 U-235m/c, and 1800 U-812 UV models in Alvium 1800 U model specifications on page 58 and in Lenses: Focal length vs. field of view on page 183. • Added the information that Alvium 1800 U-511 is supplied on request only to Sensor position accuracy on page 178. • Added new functionalities to Camera feature availability on page 181. • Added warning against voltage levels of serial communication in I/O connector pin assignment on page 214. • Added I/O use for UART on page 216. • Removed FPNC support for VSWIR models and added DPC support for 1800 U-052 and 1800 U-291 in Image data flow on page 225. • Removed the section “Feature value changes on a streaming camera” from Optimizing performance on page 230. • Applied editorial changes.
V3.6.4	2022-Apr-12	• Added notes that Alvium 1800 U-052 and 1800 U-291 currently do not support DPC and FPNC to Image data flow on page 225. • Applied minor editorial changes.

Table 2: Document history (sheet 1 of 6)

Version	Date	Remarks
V3.6.3	2022-Mar-29	Re added values for Alvium 1800 U-319c in White balance default on page 157.
V3.6.2	2022-Mar-25	Updated mass values for closed housing Alvium 1800 U-158m/c at Dimensions and mass on page 158.
V3.6.1	2022-Mar-17	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	**Firmware version**: 00.08.00.6727174b • Added Sensor ADC readout modes for maximum frame rates on page 54. • Updated conditions for Operation for maximum frame rates on page 55 and renamed Operation for medium power consumption on page 57. • Updated frame rates for model specifications tables and ROI frame rates in Alvium 1800 U model specifications on page 58. • Added note about frame rates in triggered mode for Alvium 1800 U-120m/c on page 72. • Corrected options for Exposure Modes in Alvium 1800 U-1240m/c on page 133. • Added note for non-standard S-Mount hardware options in Sensor position accuracy on page 178. • Added new section on User sets on page 180. • Added Camera feature availability on page 181. • Added information on Ignored triggers on page 224. • Updated workflows in Image data flow on page 225 for new convolution filters, and in Value changes by feature interdependencies on page 231. • Added new section Power consumption issues on page 243 and updated related • Added Requirements for USB PCIe cards and host controllers on page 237. • Applied minor editorial changes.
V3.5.1	2021-Nov-23	• Updated links to accessories. • Applied minor editorial changes.

Table 2: Document history (sheet 2 of 6)

Version	Date	Remarks
V3.5.0	2021-Nov-05	**Firmware version**: 00.07.00.81db3896 • Added 1800 U-030m and 1800 U-130m models in Specifications on page 49 and in Lenses: Focal length vs. field of view on page 183. • Updated information in Digital binning on page 57. • Updated the minimum temperature value for operation and storage from +5 °C to -20 °C. • Added contents for Power supply voltage for I/O cables on page 217. • Updated workflow in Image data flow on page 225 for new LUT and Sharpness. • Updated diagram in Value changes by feature interdependencies on page 231. • Applied minor editorial changes.
V3.4.2	2021-Aug-17	• Added icon for compliance with UKCA in Compliance notifications on page 38. • Corrected sensor specifications for Alvium 1800 U-1242m/c on page 137. • Applied editorial changes.
V3.4.1	2021-Aug-09	• Adjusted conditions for Operation for maximum frame rates on page 55. • Corrected binning ranges in the model specifications in Alvium 1800 U model specifications on page 58. • Applied editorial changes.
V3.4.0	2021-Aug-05	**Firmware version**: 00.06.00.35992 • Added 1800 U-120 model to Frame rate jitter on page 230 and Trigger delay with 1800 U-120 cameras on page 223. • Added 1800 U-511m/c, 1800 U-811m/c, and 800 U-1242m/c models in Alvium 1800 U model specifications on page 58. • For all models, added Digital binning on page 57. • Updated tables with ROI frame rates in Specifications on page 47, with new bandwidth steps, extended to 450 MBps. • Removed the previous section **Performance on reference systems** from Optimizing performance on page 230. • Added instructions for Using the U3 mode on page 239.

Table 2: Document history (sheet 3 of 6)

Version	Date	Remarks
V3.3.0	2021-Apr-12	**Firmware version**: 00.04.00.34658 • Updated ROI frame rates on page 68 for 1800 U-120m/c models. • 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 58. • Updated mass values in Dimensions and mass on page 158. • Updated instructions for Mounting the camera on page 201. • Applied editorial changes.
V3.2.2	2021-Jan-22	• Updated pixel formats in Alvium 1800 U model specifications on page 58. • Applied editorial changes.
V3.2.1	2020-Dec-15	**Firmware version**: 00.03.00.31919 • Added information on the exposure time offset in Exposure time behavior regarding ExposureMode on page 54. • Updated values for ROI frame rates and for minimum and maximum exposure time in Alvium 1800 U model specifications on page 58. • Added values for White balance default on page 157. • Updated drawings and dimension values for bare board cameras in Technical drawings on page 160. • Added information about Serial numbers of Alvium® chips and bare board cameras on page 198. • Added description for push-pull in GPIOs description on page 218. • Added Trigger features and UserSetDefault on page 223. • In Image data flow on page 225, added FPNC support for all models, except for Alvium 1800 U-2050. • Added notes about frame rates for rolling shutter cameras run in triggered mode. • Applied editorial changes.

Table 2: Document history (sheet 4 of 6)

Version	Date	Remarks
V3.2.0	2020-Jul-22	**Firmware version**: 00.02.00.29974 • Added Alvium 1800 U-240m/c, 1800 U-508m/c, and 1800 U-1240m/c models. • Updated ROI frame rates and pixel formats in Alvium 1800 U model specifications on page 58. • Added QE and spectral response to Alvium 1800 U-2050m/c on page 149. • Extended information in Shock and vibration on page 50. • Updated spectral response graphic in IR cut filter on page 177. • Added Sensor position accuracy on page 178. • Added Read before use on page 2. • Corrected minor errors.
V3.1.3	2020-Mar-12	• Corrected maximum exposure times. • Added *ExposureActive* signal to the description of sensor shutter modes. • DPC: Removed specifications into an application note. • FPNC: Updated note in Image data flow on page 225.
V3.1.2	2020-Mar-04	Applied minor changes.
V3.1.1	2020-Feb-28	• Updated frame rates and exposure time values. • Added information about frame rates with different triggering modes.
V3.1.0	2020-Feb-20	**Firmware version**: 00.01.03.29025 • Added Alvium 1800 U-319m/c, 1800 U-507m/c, 1800 U-1236m/c, and 1800 U-2050m/c models. • Added specifications for DPC. • Updated description for sensor shutter modes.
V3.0.0	2020-Jan-06	**Firmware version**: 00.01.02.28100 • Added Alvium 1800 U-040m/c, 1800 U-158m/c, and 1800 U-501m NIR models.

Table 2: Document history (sheet 5 of 6)

Version	Date	Remarks
V2.0.0	2019-Oct-18	**Firmware version**: 00.01.01.27102 • Added Alvium 1800 U-050m/c and 1800 U-120m/c models. • Updated contents about bandwidth. • Updated screenshots for camera driver installation. • Added Dark current compensation on page 233. • Updated technical drawings and dimensions for bare board in Technical drawings on page 160. • Restructured contents in Performance and troubleshooting on page 229. • Applied editorial changes.
V1.1.0	2019-Jul-01	• Added missing color pixel formats and removed separate bit depth in Specifications on page 49. • Corrected ADC bit depth in specifications for Alvium 1800 U-500m/c on page 102 and in Image data flow on page 225.
V1.0.0	2019-Jun-13	**Firmware version**: 00.01.00.26405 Release version

Table 2: Document history (sheet 6 of 6)

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

CAUTION

Risk of burns

Precautions are described

CAUTION

Injury by falling cameras or lenses

Precautions are described

CAUTION

Risk of cuts by sharp edges of lens mounts

Precautions are described

NOTICE

Material damage

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 1800: Advanced feature set or high-performance sensors	C: MIPI CSI-2 U: USB	500: 5.0 MP 050: 0.5 MP	c: color m: monochrome 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 on page 161
CRA	Chief ray angle	Alvium 1800 U-500m/c on page 102
EMVA	European Machine Vision Association	www.emva.org
ERS	Electronic rolling shutter, see RS	Shutter types affecting image readout on page 235
ESD	Electrostatic discharge	ESD on page 43
FCC	Federal Communications Commission	For customers in the USA on page 39
FPNC	Pixed pattern noise correction	Image data flow on page 225
fps	Frames per second	Alvium 1800 U-500m/c on page 102
GenICam	Generic Interface for Cameras, EMVA	www.emva.org
GND	Ground (power)	I/O connector pin assignment on page 214
GPIOs	General purpose inputs and outputs (non-isolated)	GPIOs description on page 218
GRRS	Global reset release shutter, see GRS	Shutter types affecting image readout on page 235
GRS	Global reset shutter, see GRRS	Shutter types affecting image readout on page 235
GS	Global shutter	Shutter types affecting image readout on page 235
H × V	Horizontal × Vertical (sensor resolution)	Alvium 1800 U-500m/c on page 102
KB	Kilobyte	Alvium 1800 U-500m/c on page 102
MBps	Megabytes per second	Alvium 1800 U-500m/c on page 102
MP	Megapixels (see P)	Alvium 1800 U model specifications on page 58
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 on page 164
P	Pixels (see MP)	Alvium 1800 U model specifications on page 58
PCBA	Printed circuit board assembly	PCBAs on page 44
QE	Quantum efficiency	Absolute QE on page 104
ROI	Region of interest	ROI frame rates on page 105

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

Term or acronym	Description	Reference
RS	Rolling shutter, see ERS	Shutter types affecting image readout on page 235
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 56
shutter type	Sensor specific readout, such as rolling shutter (RS) or global shutter (GS)	Shutter types affecting image readout on page 235
S-Mount	M12-Mount	Mounting and focusing S-Mount lenses on page 205

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

Compliance, safety, and intended use

This chapter includes:

Camera identification

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

Closed housing Alvium USB cameras have the Model ID: **A 1 E**.
Open housing Alvium USB cameras have the Model ID: **A 1 D.**

Model IDs are the same for standard 90° USB connector orientation.

The variants of Alvium cameras with closed housing (model ID: A 1 E) are **KC certified**. Bare board cameras and open housing cameras are unfinished devices that require housing by the customer for EMC compliance and hence cannot be KC certified.

Preparations to introduce Model IDs for Alvium **bare board cameras** are ongoing. Corresponding data will be added to a future version of this document.

Compliance notifications

National regulations on disposal must be followed.

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.

Allied Vision isn't a legal manufacturer of medical product. Instead, Allied Vision cameras and accessories may be used as components for medical product after design-in by the medical device manufacturer and based on a quality assurance agreement (QAA) between Allied Vision (supplier) and medical device manufacturer (customer). Allied Vision's duties in that respect are defined by ISO 13485, clause 7.2 (customer-related processes, equivalent to ISO 9001, clause 8.2).

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

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

Housed cameras: 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 201. 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 percent that is non-condensing.

Hardware option	Housing	Components in the cooling areas[1]	Mainboard[2]
Bare board[3]	Not applicable	-20 °C to +85 °C	See model Specifications on page 49.
Open housing[4]	-20 °C to +65 °C		
Closed housing		Not applicable	

[1]See Mounting the heat sink on page 199.

[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 areas.

Table 6: 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.

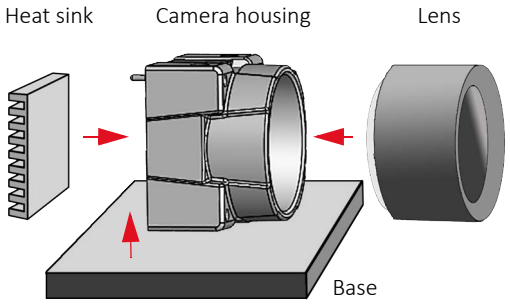


Figure 1: Setup to provide optimum heat dissipation

More information

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 cameras on page 202.
- Ensure, shock and vibration do not exceed the specified range, see Shock and vibration on page 50.
- 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.

Product safety

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

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

Provide sufficient strain relief for all cable connections to avoid short circuits and malfunctions.

PCBAs

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

Camera power

Operating the camera beyond the specified range damages the camera. 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 the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

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 49 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 214 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.
- 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.

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 the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

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 236. Some pixel formats may not be supported.

No image transfer at high bandwidths

USB 2.0 supports maximum 50 MBps. If cameras require a higher bandwidth than 50 MBps 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 areas.)
- Enable proper cooling at the cooling areas, see Mounting bare board cameras on page 201.
- 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 201.

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 48 for details.

Sensor

Sensors are sensitive to excessive radiation: focused sunlight, 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. When no lens is mounted, protect the sensor and filter by a dust cap.

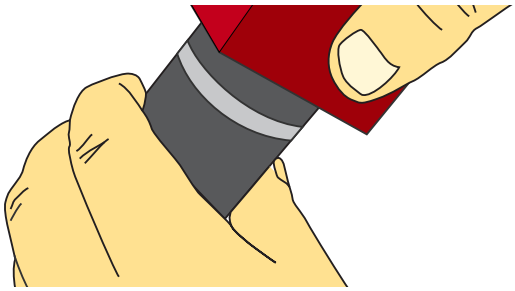
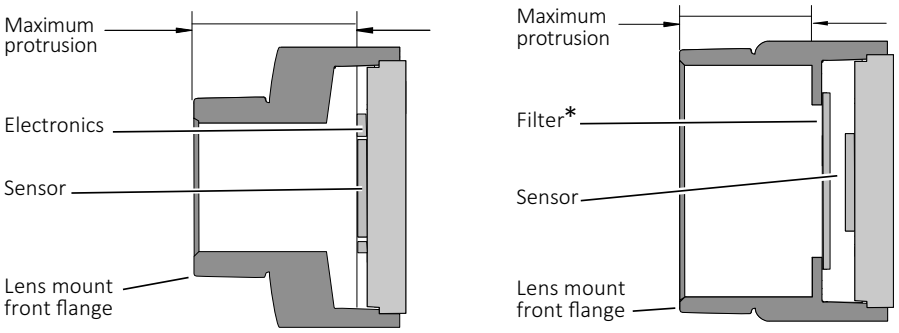


Figure 2: Holding the camera with the lens mount facing the ground

Lenses

Maximum protrusion

The sensor, filter, lens, or camera electronics can be damaged if a lens exceeding maximum protrusion is mounted to the camera. Use lenses with a maximum protrusion within camera specifications. Figure 3 shows maximum protrusion. For details, see Lens mounts and maximum protrusion on page 176.



*Only color models are equipped with an IR cut filter

Figure 3: Maximum protrusion S-Mount (left); CS-Mount and C-Mount (right)

For S-Mount lenses, read Mounting and focusing S-Mount lenses on page 205 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 areas**, see Mounting the heat sink on page 199.

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:

- GenICam GenAPI V3.1
- GenICam Standard Features Naming Convention V2.4 (SFNC)
- GenICam Pixel Format Naming Convention V2.2 (PFNC).

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

Table 7: 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 8: 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*	Not applicable

Table 9: Frequency, acceleration, and displacement for IEC 60068-6 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 10: Other parameters for IEC 60068-6 tests

IEC 60068-2-27: Shock

Parameter	Value
Axis	x, y, z
Acceleration	20 *g*
Number of shocks per axis	10
Duration per axis	11 ms
Waveform	Half sine

Table 11: Parameters for IEC 60068-2-27 tests

IEC 60068-2-64: Random vibration

Frequency	Acceleration
15 Hz to 500 Hz	0.05 $g^2/_{Hz}$

Table 12: Frequency and acceleration for IEC 60068-2-64 tests

Parameter	Value
Axis	x, y, z
Acceleration RMS (Sigma)	4.9 *g*
Acceleration peak (Sigma)	14.8 *g*
Duration per axis [hh:mm:ss]	00:30:00

Table 13: Other parameters for IEC 60068-64 tests

Notes on specifications

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

Sensor

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 percent. The uncertainty in measurement of the QE values is ±10 percent. 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 percent.

Exposure time and frame rates

Specified values

Stated values were calculated (see Operation for maximum frame rates).
Not all values were confirmed by testing. Minor deviations may occur.

Factors for exposure time and frame rates

- The **default bandwidth** for Alvium USB cameras is 200 MBps. For some models, you can achieve higher frame rates by increasing values for `MaxTransferSize` and `DeviceLinkThroughputLimit`. See Host setup and bandwidth on page 236.
- Available values and increments for **exposure time** depend on other controls, such as `DeviceLinkThroughputLimit`. See Value changes by feature interdependencies on page 231.
- For **delays**, see Exposure start delay = exposure area – exposure time. on page 223.
- 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 55 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.

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 231.

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 startup)
- 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: Data is provided for 200 MBps, 375 MBps, and 450 MBps, using 8-bit, 10-bit, and 12-bit sensor ADC readout modes, depending on model abilities. The

default value for `DeviceLinkThroughputLimit` is 200 MBps for Alvium 1800 U cameras measured as average sensor readout.

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 relations in Table 14 apply only if exposure time is shorter than readout time.

Sensor type	Shutter mode	Trigger mode	Available frame rates	ROI frame rates
Global shutter (GS)	Global shutter (GS)	Freerun	Maximum values	Increased values
	Global shutter (GS)	External trigger	Maximum values	Increased values
Rolling shutter (RS)	Rolling shutter (RS)	Freerun	Maximum values	Increased values
	Rolling shutter (RS)	External trigger	**Halved values**	Increased values
	Global reset shutter (GRS)	Freerun	Maximum values	**No increase**
	Global reset shutter (GRS)	External trigger	Maximum values	**No increase**

Table 14: Frame rates depending on shutter modes and trigger modes

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 your requirements. See Host setup and bandwidth on page 236.

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 231 for details.

`MaxTransferSize` can have an impact as well.

Differences between sensors with global shutter (GS), rolling shutter (RS), and global reset shutter (GRS) are explained in Shutter types affecting image readout on page 235. Triggering behavior differs between cameras with global shutter (GS) and rolling shutter (RS). See Triggering on page 221 for details.

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×.

Operation for medium power consumption

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

- Factory settings (camera after startup)
- 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 Dimensions and mass on page 158.

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 Technical drawings on page 160.

Alvium 1800 U model specifications

Alvium 1800 U-030 VSWIR

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; 3.28 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 MBps)
Exposure time	22 µs to 10 s (200 MBps)
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
Image buffer (RAM)	256 KB
Non-volatile memory (Flash)	1024 KB
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.2 W

Table 15: Alvium 1800 U-030 VSWIR specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-030 VSWIR			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 15: Alvium 1800 U-030 VSWIR specifications (sheet 2 of 2)

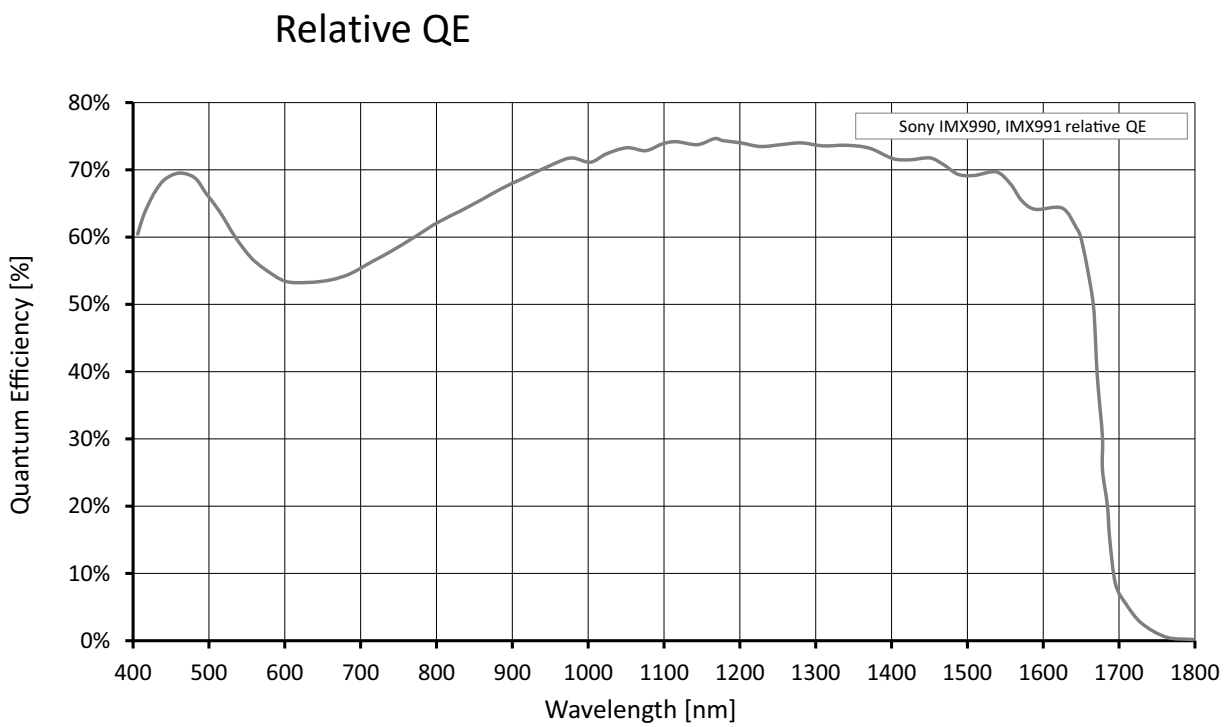


Figure 4: Alvium 1800 U-030 VSWIR (Sony IMX991) relative QE

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	656	520	0.341	249.2 / 231.0 / 133.0		
VGA	640	480	0.307	268.4 / 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	686.5 / 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 P	2644.2 / 2455.4 / 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 54 for details.

Table 16: 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 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	495 fps (at ≥250 MBps)	
Exposure time	28 µs to 10 s (250 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.1 W	

Table 17: Alvium 1800 U-040m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-040m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 17: Alvium 1800 U-040m/c specifications (sheet 2 of 2)

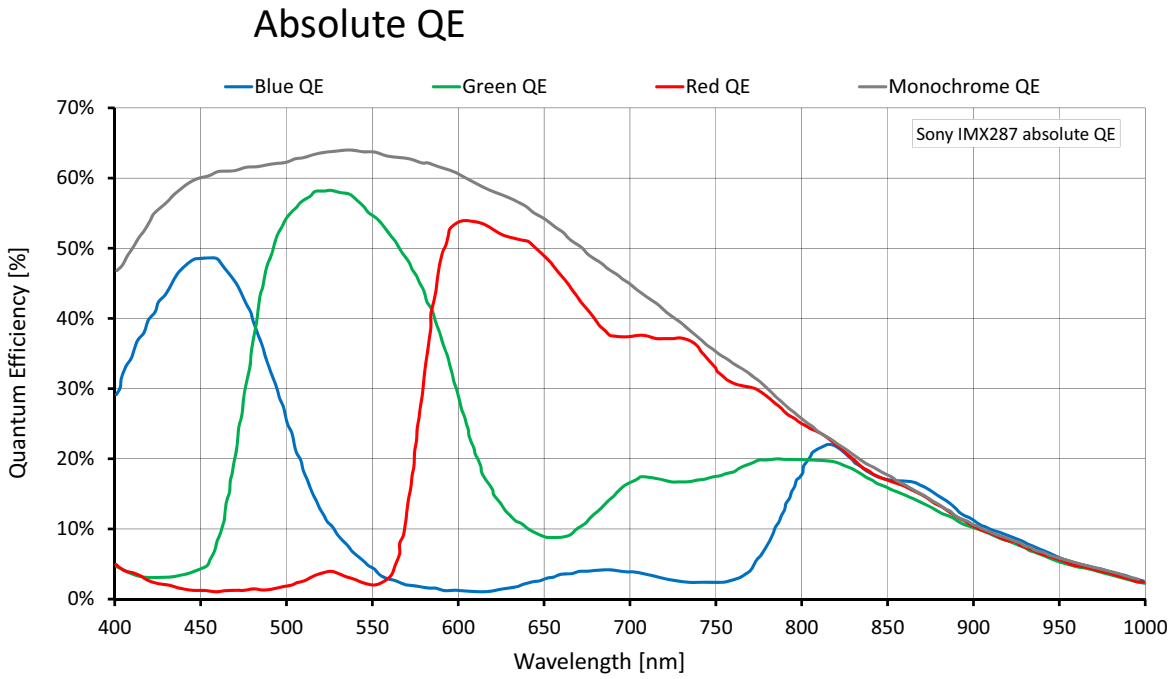


Figure 5: Alvium 1800 U-040m/c (Sony IMX287) absolute QE

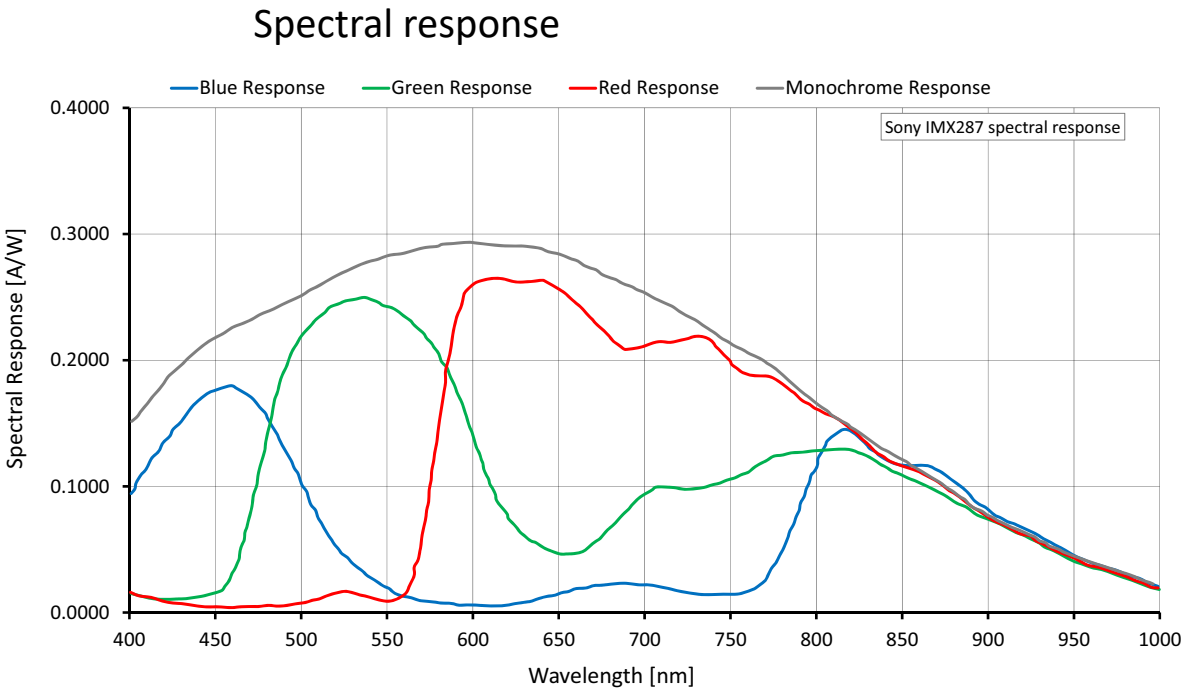


Figure 6: Alvium 1800 U-040m/c (Sony IMX287) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 250 MBps. Increasing the `DeviceLinkThroughputLimit` value does not increase frame rates.

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	728	544	0.396	495.6 / 409.9 / 302.3		446.0 / 225.2 / 224.0
VGA	640	480	0.307	555.3 / 459.3 / 338.9		555.3 / 285.9 / 284.9
HVGA	480	320	0.154	788.4 / 655.5 / 483.5		788.4 / 541.3 / 483.5
QVGA	320	240	0.077	994.5 / 836.2 / 617.7		
HQVGA	240	160	0.038	1346.5 / 1149.3 / 847.2		
QQVGA	160	120	0.019	1636.0 / 1406.1 / 1037.7		
Max. × half	728	272	0.198	889.8 / 736.0 / 544.8		802.9 / 409.1 / 405.9
Max. × min.	728	8	0.006	3901.3 / 3226.9 / 2462.7		3591.8 / 1974.5 / 1915.3
Min. × max.	8	544	0.004	498.9 / 417.4 / 306.8		
Min. × min.	8	8	64 P	4112.2 / 3756.6 / 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 54 for details.

Table 18: Alvium 1800 U-040m/c ROI frame rates

Alvium 1800 U-050m/c

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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerGR8, BayerGR10, BayerGR10p, BGR8, RGB8 (default)
Maximum frame rate	117 fps (at ≥200 MBps)	
Exposure time	64 µs to 10 s (200 MBps)	
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 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 1.7 W	

Table 19: Alvium 1800 U-050m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-050m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 19: Alvium 1800 U-050m/c specifications (sheet 2 of 2)

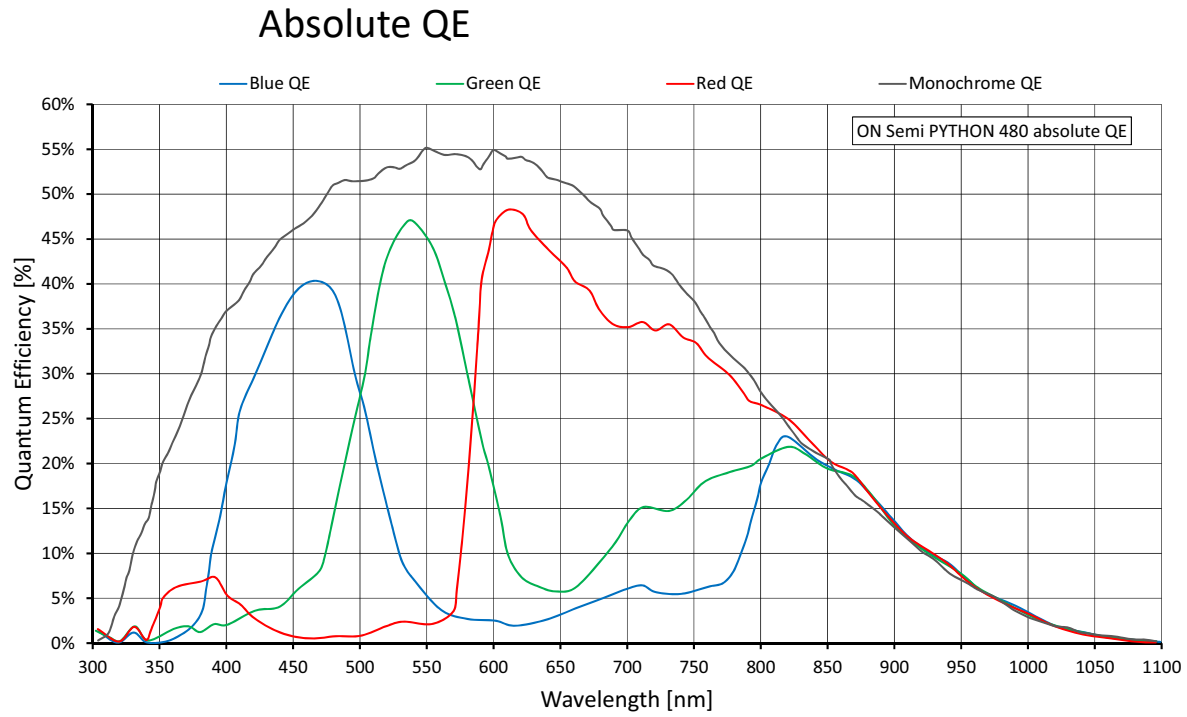


Figure 7: Alvium 1800 U-050m/c (ON Semi PYTHON 480) absolute QE

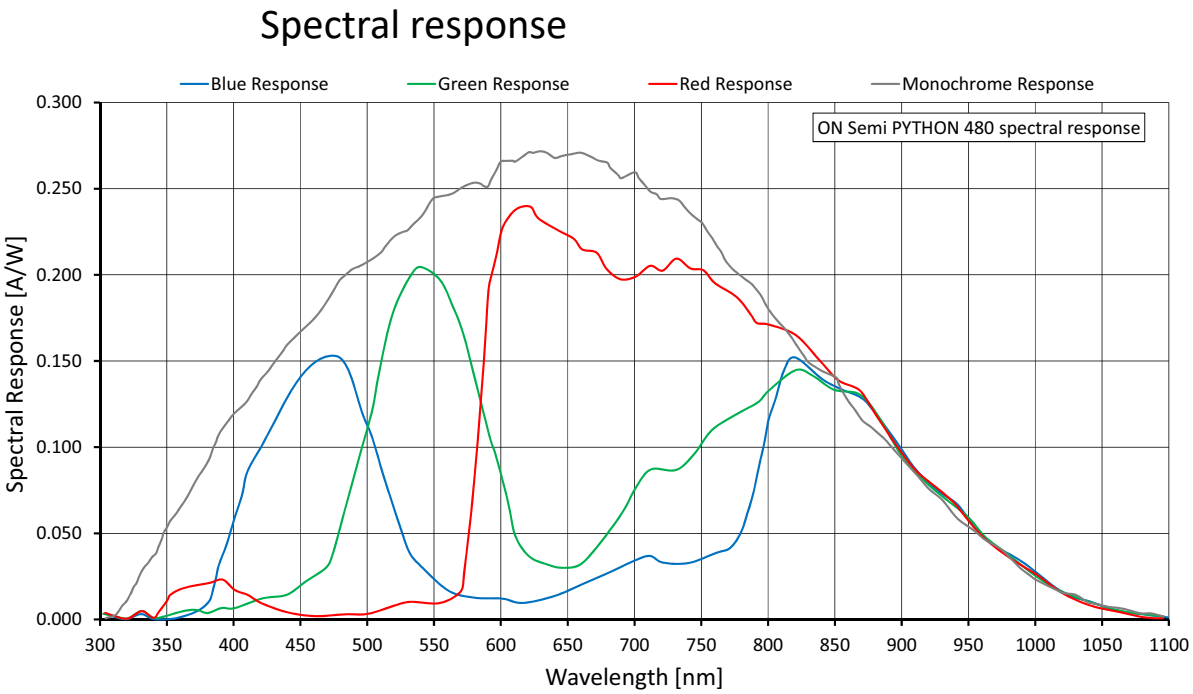


Figure 8: Alvium 1800 U-050m/c (ON Semi PYTHON 480) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	808	608	0.491	117.1 / 117.1		
SVGA	800	600	0.480	119.6 / 119.6		
VGA	640	480	0.307	176.7 / 176.7		
HVGA	480	320	0.154	313.6 / 313.6		
QVGA	320	240	0.077	514.2 / 514.2		
HQVGA	240	160	0.038	784.8 / 784.8		
QQVGA	160	120	0.019	1069.8 / 1069.8		
Max. × half	808	304	0.246	219.5 / 219.5		
Max. × min.	808	8	0.006	1476.0 / 1476.0		
Min. × max.	8	608	0.005	726.6 / 726.6		
Min. × min.	8	8	64 P	1988.8 / 1988.8		

[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 20: 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	691 fps (at 450 MBps)	
Exposure time	21 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.2 W	

Table 21: Alvium 1800 U-052m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-052m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 21: Alvium 1800 U-052m/c specifications (sheet 2 of 2)

Absolute QE, spectral response

Diagrams will be added in a future version of this document.

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	816	624	0.509	691.1 / 357.1 / 362.3	579.0 / 298.6 / 304.3	320.1 / 161.0 / 165.1
SVGA	800	600	0.480	705.4 / 371.6 / 378.5	605.8 / 309.8 / 316.8	331.3 / 168.6 / 172.2
VGA	640	480	0.307	854.4 / 549.9 / 557.1	854.4 / 466.6 / 471.0	498.2 / 252.8 / 258.7
HVGA	480	320	0.154	1159.1 / 957.5 / 851.8	1159.1 / 820.6 / 851.8	890.9 / 456.3 / 470.9
QVGA	320	240	0.077	1421.8 / 1174.9 / 1056.6		1421.8 / 825.0 / 857.0
HQVGA	240	160	0.038	1813.8 / 1505.0 / 1371.3		1813.8 / 1388.9 / 1371.3
QQVGA	160	120	0.019	2060.2 / 1711.0 / 1572.0		
Max. × half	816	312	0.255	1123.4 / 590.1 / 604.4	947.2 / 495.6 / 510.4	532.1 / 269.3 / 279.7
Max. × min.	816	8	0.007	2999.8 / 1697.5 / 1821.2	2602.0 / 1455.2 / 1580.5	1575.8 / 822.4 / 914.4
Min. × max.	8	624	0.005	724.1 / 598.4 / 526.1		
Min. × min.	8	8	64 P	3739.4 / 3125.0 / 3045.0		

[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 54 for details.

Table 22: 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	BayerGR8, BayerGR10, BayerGR10p, BayerGR12, BayerGR12p, BGR8, RGB8 (default)
Maximum frame rate	52 fps[1] (at ≥200 MBps)	
Exposure time	57 µs to 12 s (200 MBps)	
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 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 1.5 W	

[1] In triggered mode, maximum frame rates require minimum exposure times.

Table 23: Alvium 1800 U-120m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-120m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 23: Alvium 1800 U-120m/c specifications (sheet 2 of 2)

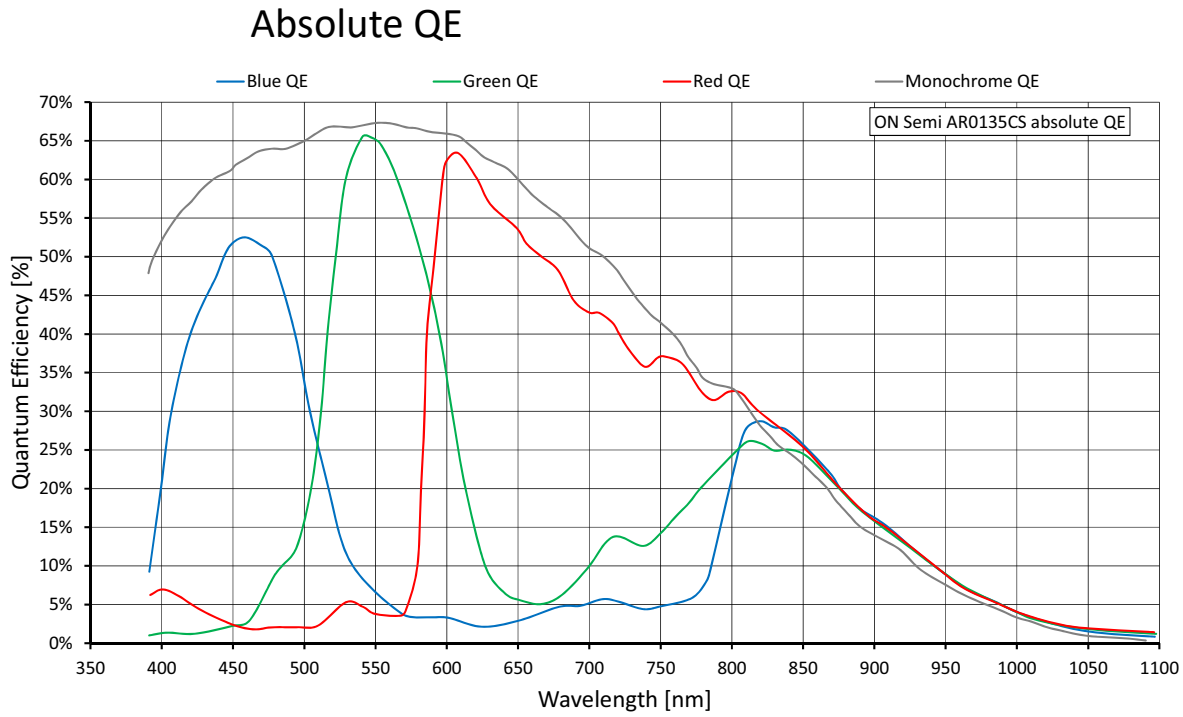


Figure 9: Alvium 1800 U-120m/c (ON Semi AR0135CS) absolute QE

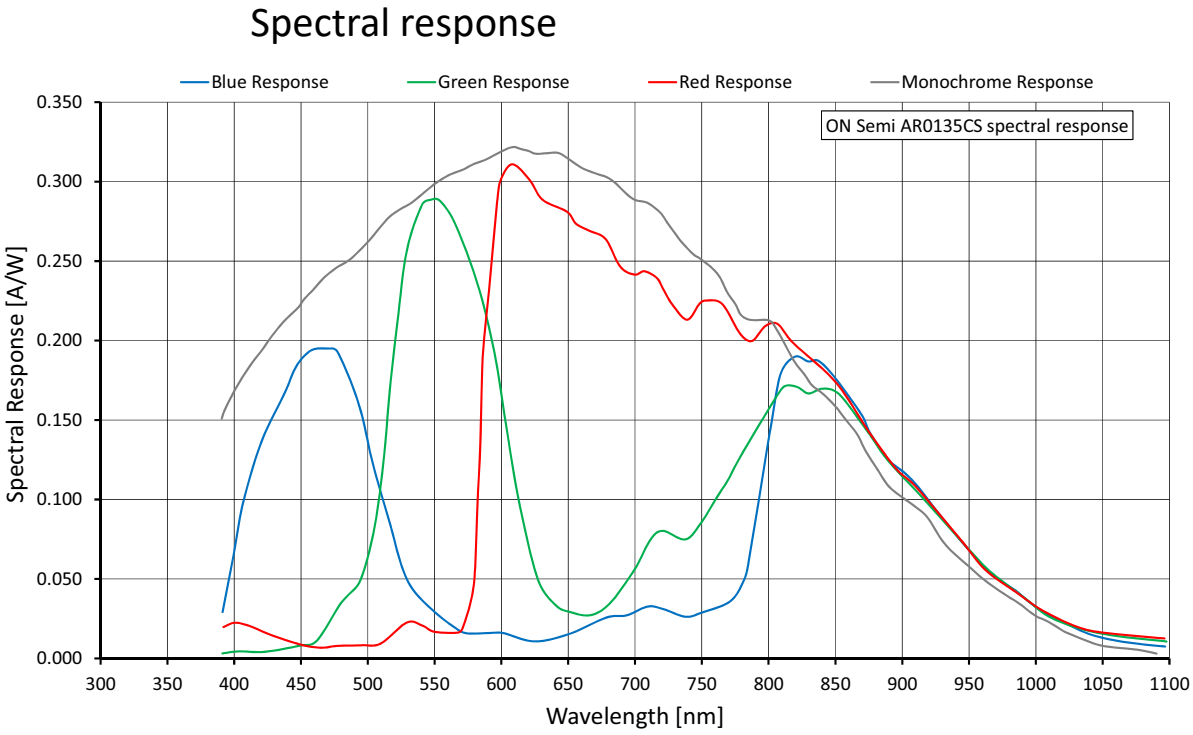


Figure 10: Alvium 1800 U-120m/c (ON Semi AR0135CS) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 200 MBps. 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 MBps	375 MBps	200 MBps
Full resolution	1280	960	1.229	52.8 / 52.8		
HD 720	1280	720	0.922	69.2 / 69.2		
XGA	1024	768	0.786	65.2 / 65.2		
SVGA	800	600	0.480	81.9 / 81.9		
VGA	640	480	0.307	100.4 / 100.4		
HVGA	480	320	0.154	143.5 / 143.5		
QVGA	320	240	0.077	160.8 / 160.8		
HQVGA	240	160	0.038	160.8 / 160.8		
QQVGA	160	120	0.019	160.8 / 160.8		
Max. × half	1280	480	0.614	100.3 / 100.3		
Max. × min.	1280	8	0.010	160.5 / 160.5		
Min. × max.	8	960	0.008	52.8 / 52.8		
Min. × min.	8	8	64 P	160.8 / 160.8		

[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 24: Alvium 1800 U-120m/c ROI frame rates

Alvium 1800 U-130 VSWIR

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 × 5.12 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	Mono8, Mono10, Mono10p, Mono12, Mono12p
Maximum frame rate	130 fps (at ≥200 MBps)	
Exposure time	22 µs to 10 s (200 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.3 W	

Table 25: 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 areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 25: Alvium 1800 U-130 VSWIR specifications (sheet 2 of 2)

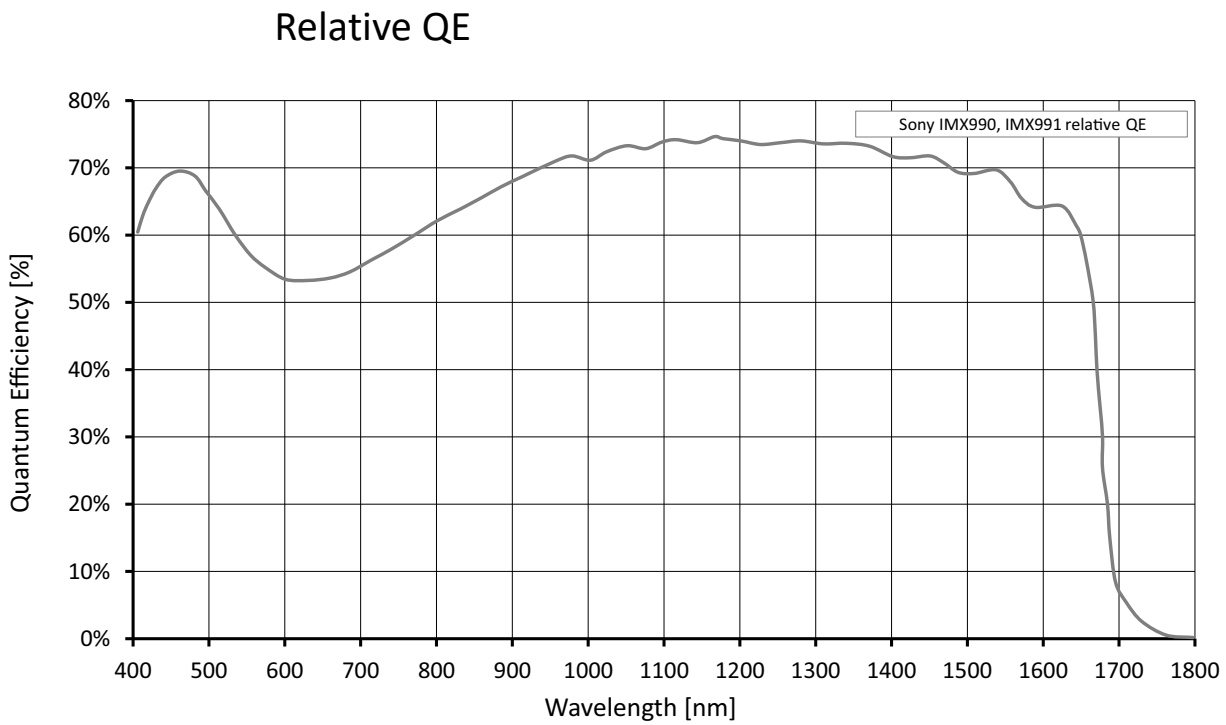


Figure 11: Alvium 1800 U-130 VSWIR (Sony IMX990) relative QE

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
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 / 72.1 / 70.3
HD 720	1280	720	0.922	183.3 / 169.8 / 97.8		183.3 / 100.3 / 97.8
XGA	1024	768	0.786	173.3 / 160.5 / 92.4		173.3 / 117.9 / 92.4
SVGA	800	600	0.480	218.3 / 202.4 / 116.4		218.3 / 190.5 / 116.4
VGA	640	480	0.307	268.4 / 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	686.5 / 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		246.6 / 133.8 / 131.8
Max. × min.	1296	8	0.010	2131.2 / 1921.6 / 1186.2		2131.2 / 1221.3 / 1186.2
Min. × max.	8	1032	0.008	132.5 / 123.0 / 70.4		
Min. × min.	8	8	64 P	2644.2 / 2455.4 / 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 54 for details.

Table 26: Alvium 1800 U-130 VSWIR 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 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	258 fps (at 450 MBps)	
Exposure time	27 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.6 W	

Table 27: Alvium 1800 U-158m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-158m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 27: Alvium 1800 U-158m/c specifications (sheet 2 of 2)

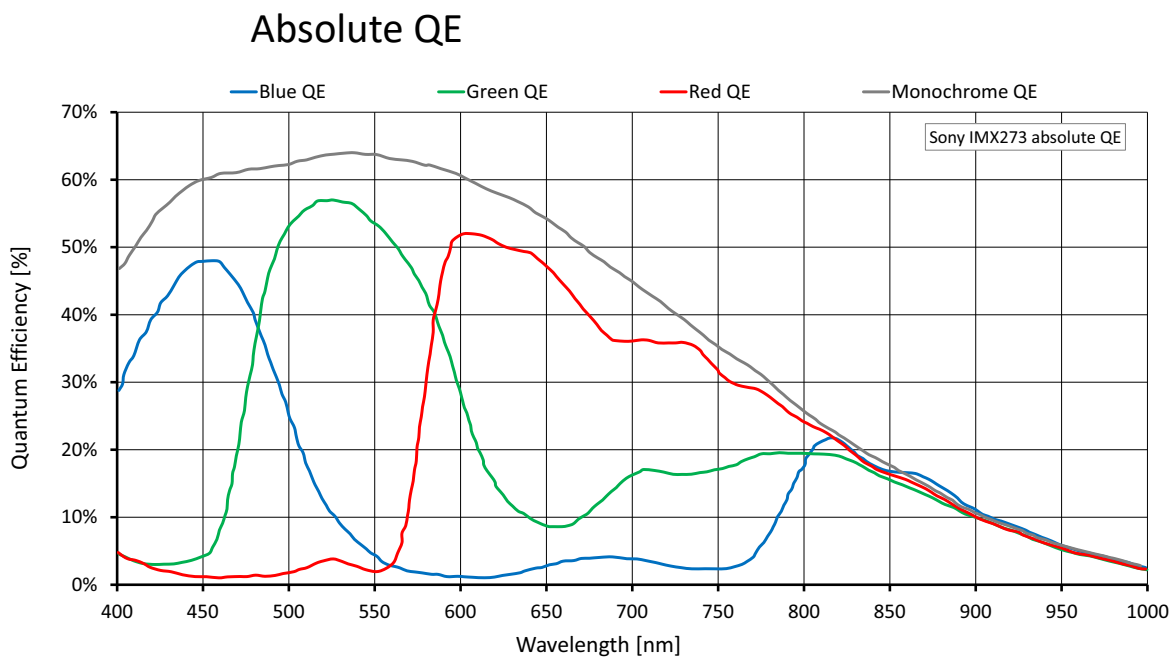


Figure 12: Alvium 1800 U-158m/c (Sony IMX273) absolute QE

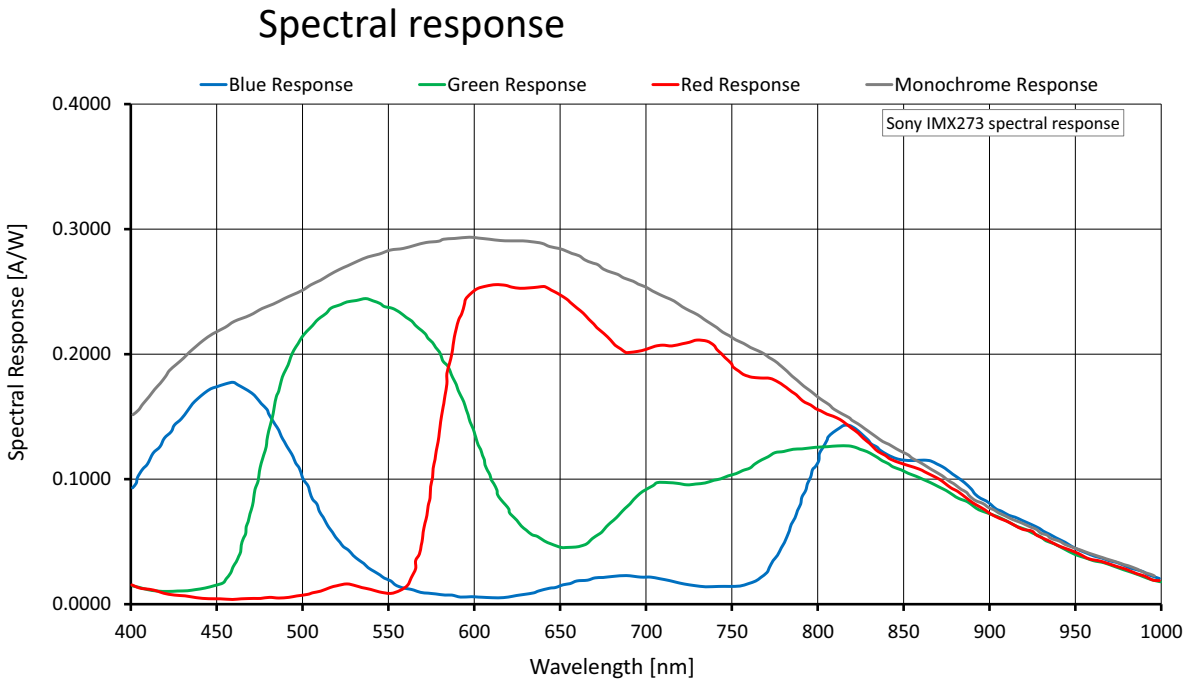


Figure 13: Alvium 1800 U-158m/c (Sony IMX273) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	1456	1088	1.584	258.1 / 131.6 / 130.8	217.0 / 110.5 / 109.7	118.1 / 59.5 / 59.4
WXGA+	1440	900	1.296	312.2 / 158.7 / 157.8	262.0 / 133.0 / 132.2	143.1 / 72.1 / 71.7
SXGA	1280	1024	1.311	278.5 / 159.0 / 157.9	261.5 / 133.0 / 132.5	142.8 / 71.6 / 71.5
HD 720	1280	720	0.922	383.4 / 219.8 / 217.9	360.3 / 184.1 / 183.1	197.9 / 99.4 / 99.3
XGA	1024	768	0.786	364.8 / 259.1 / 218.8	364.8 / 215.8 / 215.9	231.3 / 116.9 / 117.1
SVGA	800	600	0.480	458.3 / 373.4 / 275.7	458.3 / 345.8 / 275.7	370.0 / 188.5 / 188.2
VGA	640	480	0.307	561.5 / 457.6 / 337.7		561.5 / 285.4 / 284.4
HVGA	480	320	0.154	799.4 / 652.1 / 482.2		799.4 / 539.9 / 482.2
QVGA	320	240	0.077	1007.7 / 833.4 / 617.7		
HQVGA	240	160	0.038	1362.9 / 1144.1 / 847.2		
QQVGA	160	120	0.019	1654.4 / 1398.3 / 1037.7		
Max. × half	1456	544	0.792	479.2 / 247.3 / 244.8	404.9 / 208.2 / 206.1	223.0 / 112.9 / 112.5
Max. × min.	1456	8	0.012	3073.8 / 1844.5 / 1736.1	2763.9 / 1620.5 / 1537.1	1795.9 / 977.6 / 949.6
Min. × max.	8	1088	0.009	267.9 / 219.2 / 161.2		
Min. × min.	8	8	64 P	4125.0 / 3701.4 / 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 54 for details.

Table 28: Alvium 1800 U-158m/c ROI frame rates

Alvium 1800 U-234m/c (coming soon)

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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerGR8, BayerGR10, BayerGR10p, BGR8, RGB8 (default)
Maximum frame rate	40 fps (at ≥200 MBps)	
Exposure time	53 µs to 10 s (200 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.3 W	

Table 29: 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 areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 29: Alvium 1800 U-234m/c specifications (sheet 2 of 2)

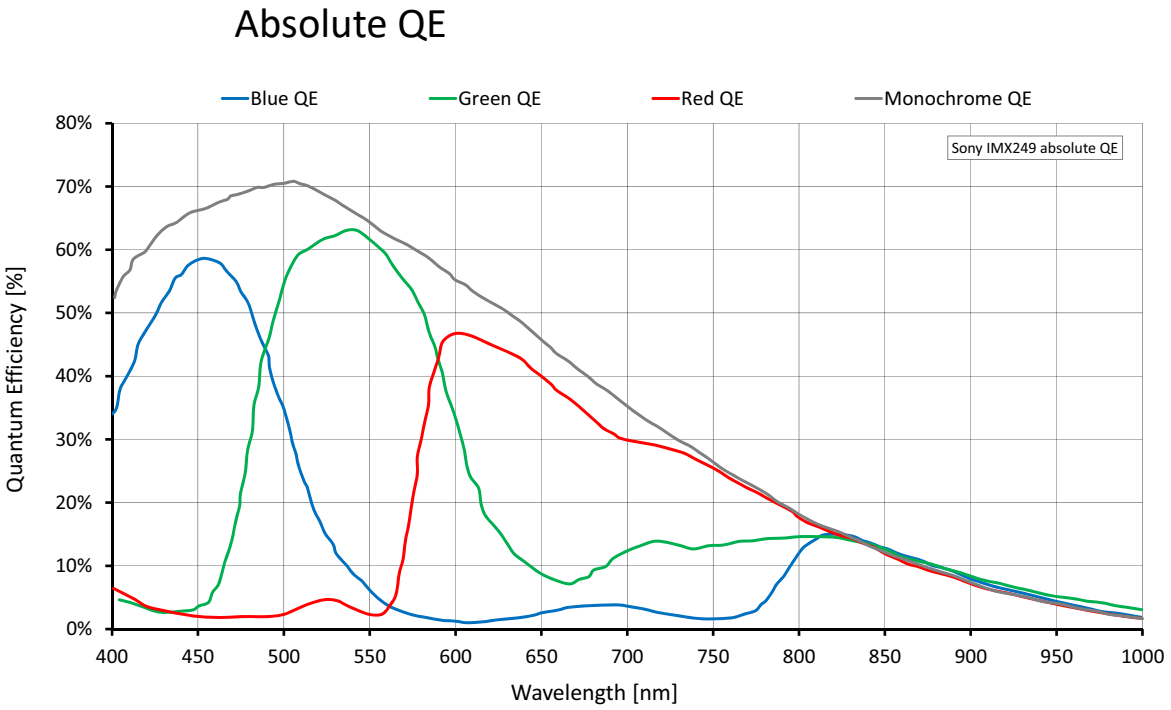


Figure 14: Alvium 1800 U-234m/c (Sony IMX249) absolute QE

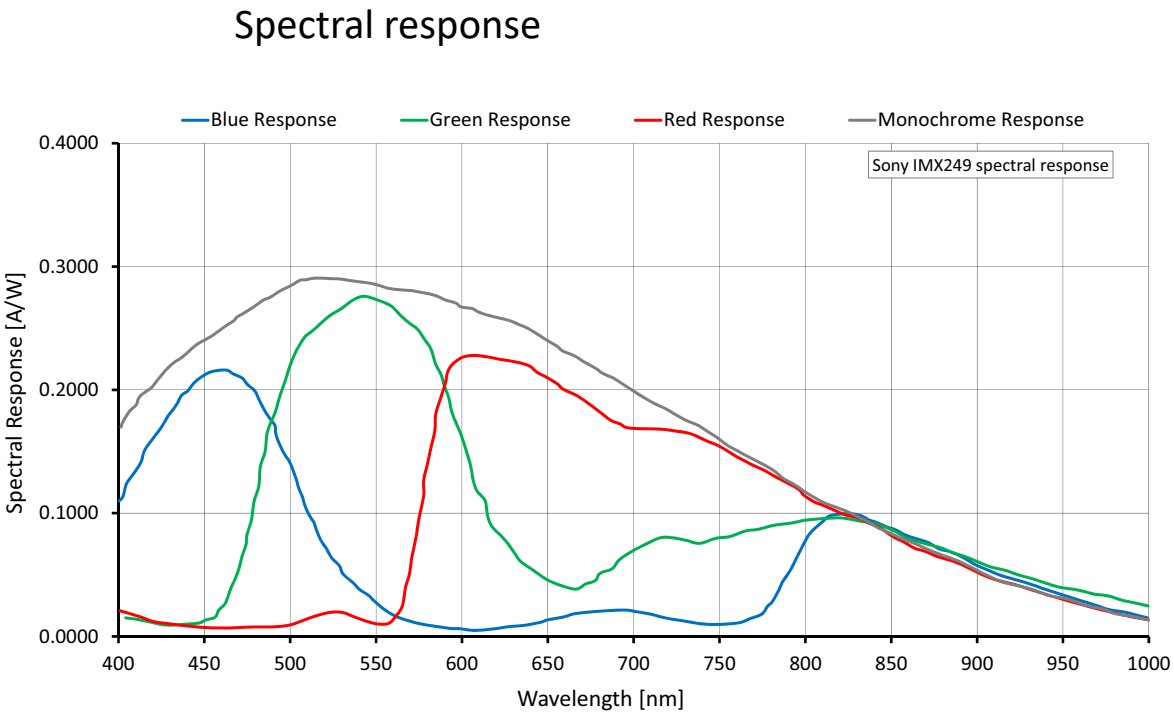


Figure 15: Alvium 1800 U-234m/c (Sony IMX249) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	1936	1216	2.354	40.5 / 31.6		
Full HD	1920	1080	2.074	45.3 / 35.4		
UXGA	1600	1200	1.920	41.0 / 32.0		
WXGA+	1440	900	1.296	54.0 / 42.1		
SXGA	1280	1024	1.311	47.8 / 37.2		
HD 720	1280	720	0.922	66.6 / 51.9		
XGA	1024	768	0.786	62.7 / 48.9		
SVGA	800	600	0.480	79.0 / 61.6		
VGA	640	480	0.307	97.0 / 75.6		
HVGA	480	320	0.154	139.2 / 108.5		
QVGA	320	240	0.077	177.8 / 138.6		
HQVGA	240	160	0.038	245.9 / 192.5		
QQVGA	160	120	0.019	305.9 / 238.4		
Max. × half	1936	608	1.177	77.6 / 60.6		
Max. × min.	1936	8	0.015	828.8 / 656.5		
Min. × max.	8	1216	0.010	40.6 / 31.7		
Min. × min.	8	8	64 P	917.6 / 715.1		

[1] 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 54 for details.

Table 30: Alvium 1800 U-234m/c ROI frame rates

Alvium 1800 U-235m/c (coming soon)

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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerGR8, BayerGR10, BayerGR10p, BGR8, RGB8 (default)
Maximum frame rate	90 fps (at 450 MBps)	
Exposure time	25 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.0 W	

Table 31: Alvium 1800 U-235m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-235m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 31: Alvium 1800 U-235m/c specifications (sheet 2 of 2)

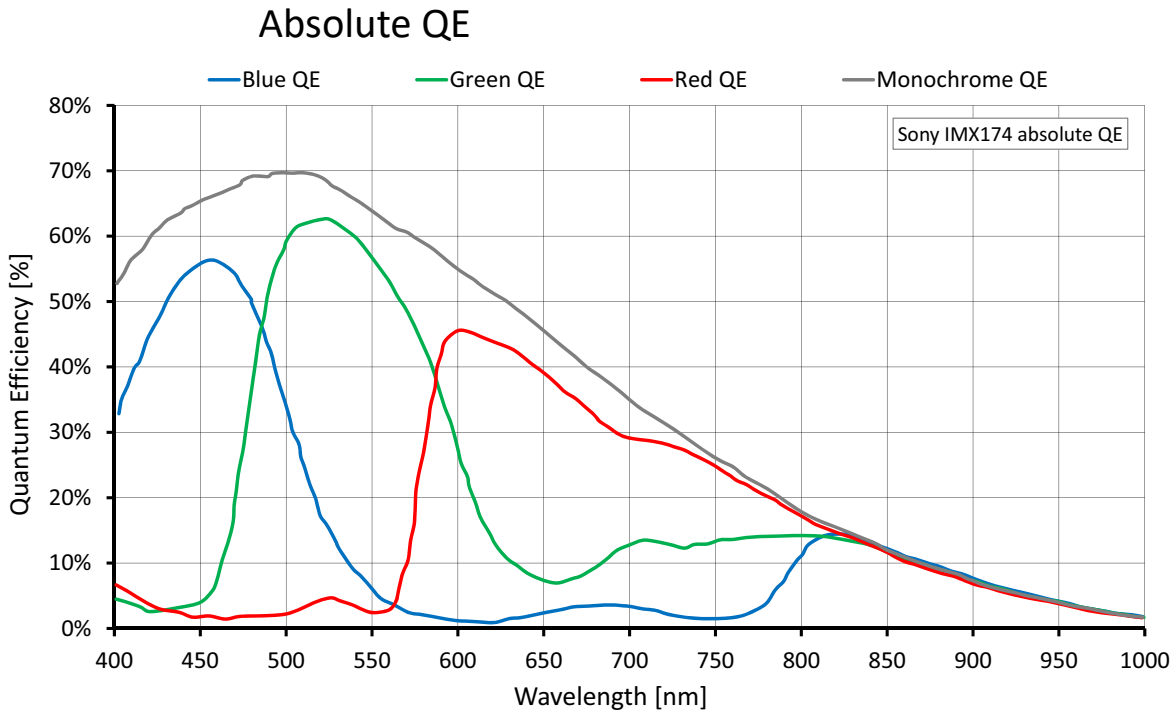


Figure 16: Alvium 1800 U-235m/c (Sony IMX174) absolute QE

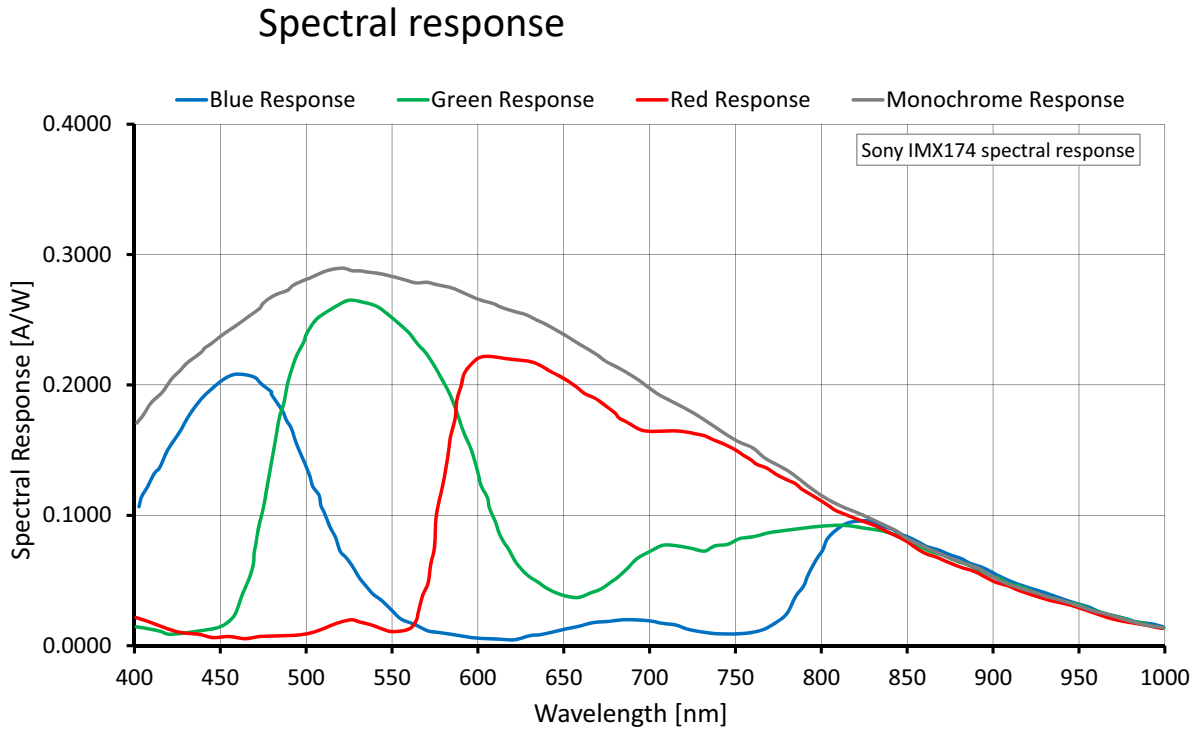


Figure 17: Alvium 1800 U-235m/c (Sony IMX174) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	1936	1216	2.354	90.1 / 89.5	75.2 / 75.1	40.5 / 40.4
Full HD	1920	1080	2.074	101.6 / 101.0	84.6 / 84.7	45.6 / 45.6
UXGA	1600	1200	1.920	110.2 / 110.2	92.3 / 91.8	49.6 / 49.6
WXGA+	1440	900	1.296	159.3 / 158.5	133.5 / 132.8	72.4 / 72.0
SXGA	1280	1024	1.311	159.6 / 144.6	133.4 / 133.0	71.9 / 71.8
HD 720	1280	720	0.922	220.9 / 200.1	185.0 / 184.1	99.9 / 99.8
XGA	1024	768	0.786	242.8 / 189.8	216.9 / 189.8	117.5 / 117.7
SVGA	800	600	0.480	305.9 / 238.9		189.7 / 189.4
VGA	640	480	0.307	376.0 / 293.3		287.5 / 286.5
HVGA	480	320	0.154	538.2 / 420.8		
QVGA	320	240	0.077	689.6 / 539.6		
HQVGA	240	160	0.038	955.0 / 744.9		
QQVGA	160	120	0.019	1189.6 / 927.8		
Max. × half	1936	608	1.177	170.9 / 169.1	142.9 / 142.4	77.4 / 77.2
Max. × min.	1936	8	0.015	1468.5 / 1376.8	1285.7 / 1223.8	781.2 / 758.3
Min. × max.	8	1216	0.010	160.7 / 125.3		
Min. × min.	8	8	64 P	3507.3 / 2735.4		

[1] 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 54 for details.

Table 32: 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	178 fps (at 450 MBps)	
Exposure time	25 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.0 W	

Table 33: Alvium 1800 U-240m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-240m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 33: Alvium 1800 U-240m/c specifications (sheet 2 of 2)

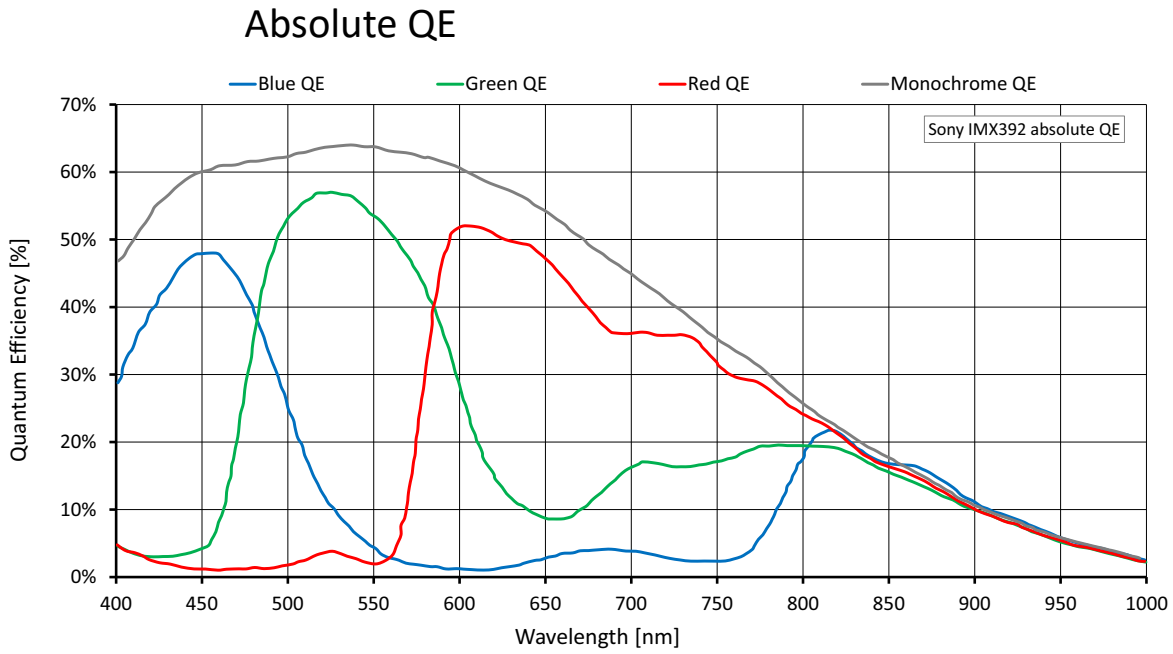


Figure 18: Alvium 1800 U-240m/c (Sony IMX392) absolute QE

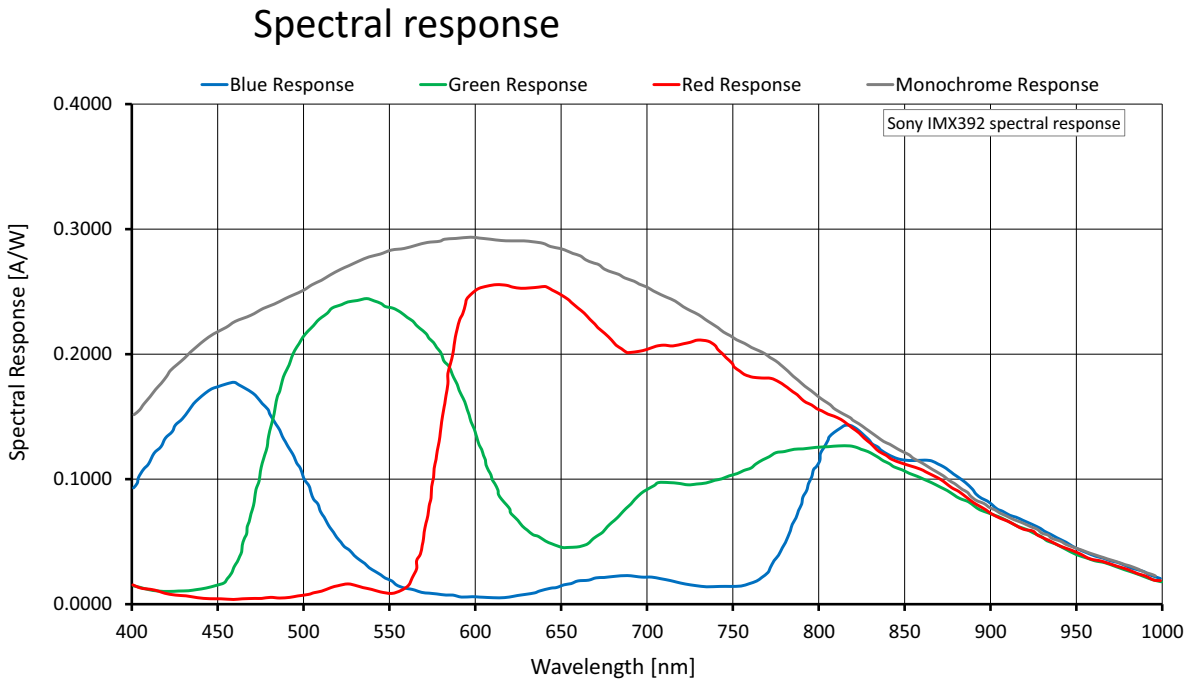


Figure 19: Alvium 1800 U-240m/c (Sony IMX392) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	1936	1216	2.354	178.3 / 90.3 / 89.8	149.3 / 75.3 / 75.3	80.6 / 40.5 / 40.5
Full HD	1920	1080	2.074	199.2 / 101.8 / 101.3	166.8 / 84.8 / 85.0	90.7 / 45.7 / 45.8
UXGA	1600	1200	1.920	195.7 / 110.4 / 110.5	181.4 / 92.4 / 92.1	98.6 / 49.7 / 49.8
WXGA+	1440	900	1.296	256.2 / 159.6 / 159.1	256.2 / 133.8 / 133.3	143.7 / 72.6 / 72.3
SXGA	1280	1024	1.311	228.0 / 159.8 / 152.7	228.0 / 133.7 / 133.4	143.4 / 72.0 / 72.1
HD 720	1280	720	0.922	315.1 / 221.4 / 211.4	315.1 / 185.5 / 185.0	199.0 / 100.2 / 100.3
XGA	1024	768	0.786	299.3 / 246.7 / 200.8	299.3 / 217.4 / 200.8	232.4 / 117.8 / 118.2
SVGA	800	600	0.480	376.6 / 311.1 / 253.0		372.2 / 190.2 / 190.6
VGA	640	480	0.307	462.8 / 381.9 / 311.4		462.8 / 288.6 / 288.6
HVGA	480	320	0.154	660.1 / 548.5 / 447.1		
QVGA	320	240	0.077	836.1 / 703.9 / 574.7		
HQVGA	240	160	0.038	1140.2 / 972.9 / 800.1		
QQVGA	160	120	0.019	1393.6 / 1199.1 / 989.5		
Max. × half	1936	608	1.177	334.8 / 171.4 / 170.1	281.4 / 143.3 / 143.2	153.5 / 77.7 / 77.7
Max. × min.	1936	8	0.015	2495.0 / 1506.7 / 1445.7	2222.5 / 1320.9 / 1289.1	1432.3 / 805.7 / 805.7
Min. × max.	8	1216	0.010	196.6 / 162.7 / 132.2		
Min. × min.	8	8	0.000	3688.9 / 3437.5 / 2933.9		

[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 54 for details.

Table 34: 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	144 fps (at 450 MBps)	
Exposure time	16 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.2 W	

Table 35: Alvium 1800 U-291m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-291m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 35: Alvium 1800 U-291m/c specifications (sheet 2 of 2)

Absolute QE, spectral response

Diagrams will be added in a future version of this document.

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	1944	1472	2.862	144.4 / 73.4 / 73.7	121.0 / 61.6 / 61.3	65.5 / 33.0 / 33.0
Full HD	1920	1080	2.074	194.2 / 99.3 / 99.1	162.6 / 82.7 / 83.1	88.3 / 44.6 / 44.8
UXGA	1600	1200	1.920	201.8 / 108.0 / 108.3	177.3 / 90.4 / 90.3	96.3 / 48.6 / 48.8
WXGA+	1440	900	1.296	261.3 / 154.5 / 154.4	254.2 / 129.5 / 129.3	138.8 / 70.2 / 70.1
SXGA	1280	1024	1.311	234.5 / 155.8 / 155.3	234.5 / 130.3 / 130.3	139.5 / 70.2 / 70.4
HD 720	1280	720	0.922	320.6 / 213.8 / 213.1	320.6 / 179.1 / 179.1	191.6 / 96.7 / 97.0
XGA	1024	768	0.786	304.8 / 252.5 / 214.3	304.8 / 210.3 / 211.4	224.3 / 113.9 / 114.6
SVGA	800	600	0.480	380.5 / 315.6 / 268.5		356.1 / 182.4 / 183.3
VGA	640	480	0.307	462.8 / 383.8 / 326.9		462.8 / 274.3 / 275.2
HVGA	480	320	0.154	646.8 / 539.2 / 460.6		646.8 / 510.5 / 460.6
QVGA	320	240	0.077	813.4 / 680.3 / 582.6		
HQVGA	240	160	0.038	1086.8 / 909.9 / 782.6		
QQVGA	160	120	0.019	1306.3 / 1102.9 / 952.1		
Max. × half	1944	736	1.431	269.3 / 138.2 / 138.7	226.5 / 116.3 / 115.7	123.6 / 62.7 / 62.8
Max. × min.	1944	8	0.016	1863.1 / 1096.3 / 1091.1	1635.6 / 954.7 / 949.8	1005.4 / 558.5 / 570.5
Min. × max.	8	1472	0.012	171.0 / 141.3 / 119.8		
Min. × min.	8	8	64 P	3048.0 / 2663.2 / 2368.0		

[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 54 for details.

Table 36: 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	54 fps (at ≥200 MBps)	
Exposure time	37 µs to 10 s (200 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.4 W	

Table 37: Alvium 1800 U-319m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-319m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 37: Alvium 1800 U-319m/c specifications (sheet 2 of 2)

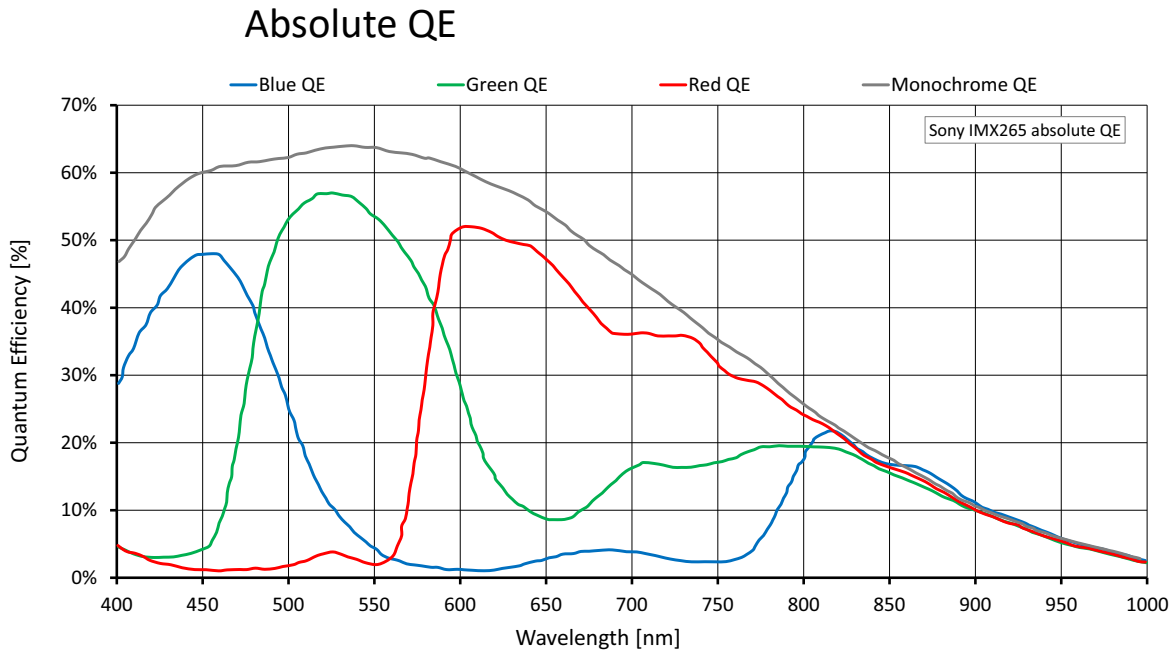


Figure 20: Alvium 1800 U-319m/c (Sony IMX265) absolute QE

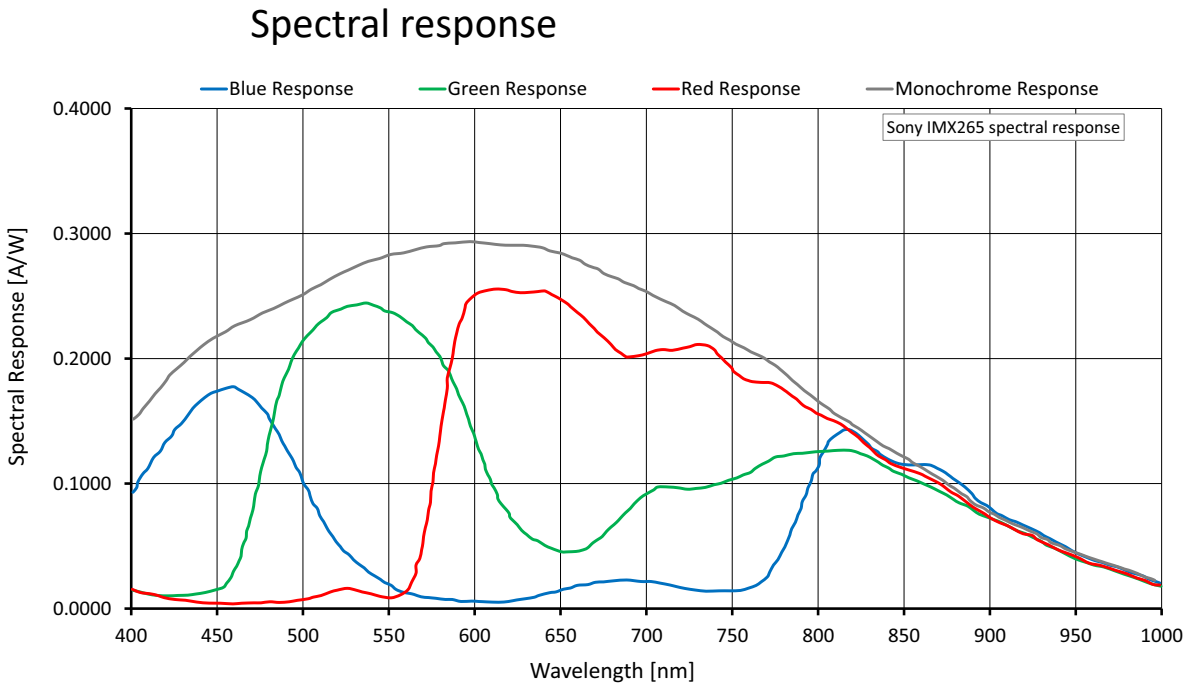


Figure 21: Alvium 1800 U-319m/c (Sony IMX265) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2064	1544	3.187	54.2 / 54.2		54.2 / 30.2
QXGA	2048	1536	3.146	54.4 / 54.4		54.4 / 30.6
Full HD	1920	1080	2.074	76.2 / 76.2		76.2 / 45.8
UXGA	1600	1200	1.920	69.1 / 69.1		69.1 / 49.8
WXGA+	1440	900	1.296	90.9 / 90.9		90.9 / 72.3
SXGA	1280	1024	1.311	80.5 / 80.5		80.5 / 72.0
HD 720	1280	720	0.922	112.0 / 112.0		112.0 / 100.2
XGA	1024	768	0.786	105.9 / 105.9		
SVGA	800	600	0.480	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	301.6 / 301.6		
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		104.1 / 58.4
Max. × min.	2064	8	0.017	1193.8 / 1193.8		1193.8 / 755.3
Min. × max.	8	1544	0.012	54.7 / 54.7		
Min. × min.	8	8	64 P	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 38: Alvium 1800 U-319m/c 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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerGR8, BayerGR10, BayerGR10p, BGR8, RGB8 (default)
Maximum frame rate	68 fps[1] (at ≥375 MBps)	
Exposure time	8 µs to 0.4 s (375 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.4 W	
[1] In triggered mode: 34 fps		

Table 39: Alvium 1800 U-500m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-500m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[2]**	**Mainboard[3]**
	Bare board[4]	Not applicable	-20 °C to +85 °C	-20 °C to +85 °C
	Open housing[5]	-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 V2.0 (GenICam Access)			

[2] See Mounting the heat sink on page 199.

[3] Output by `DeviceTemperature`

[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.

[5] Temperature values must be observed for the housing **and** for the cooling areas.

Table 39: Alvium 1800 U-500m/c specifications (sheet 2 of 2)

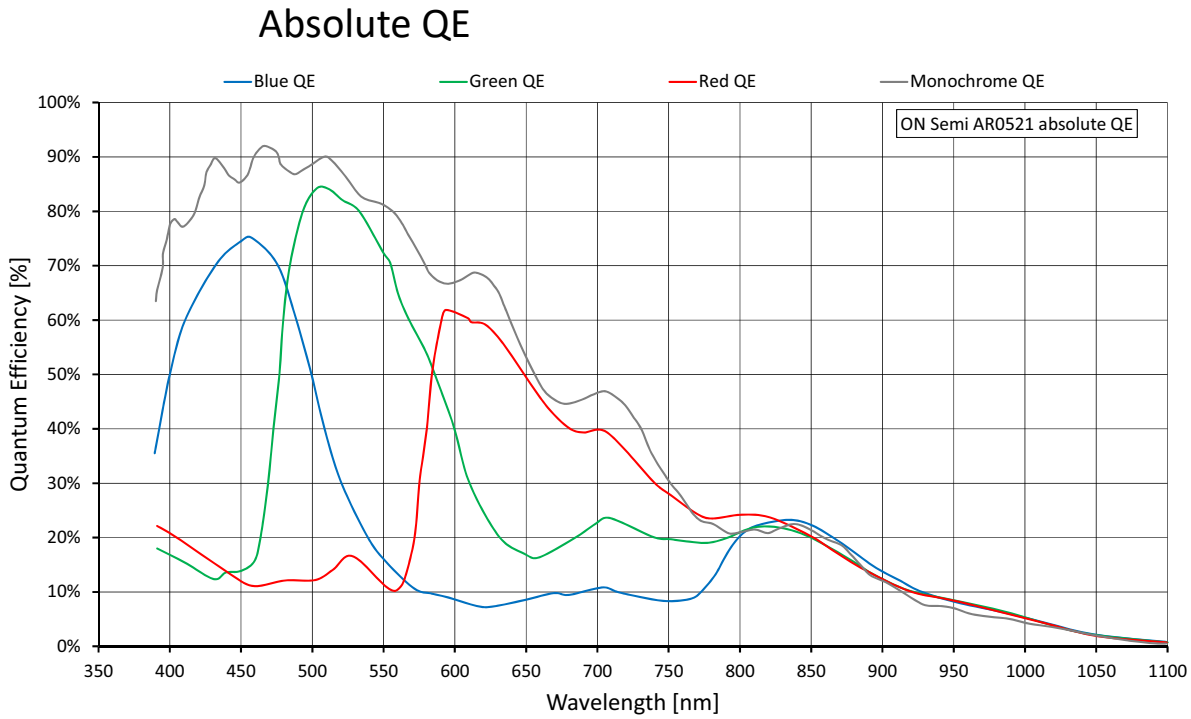


Figure 22: Alvium 1800 U-500m/c (ON Semi AR0521SR) absolute QE

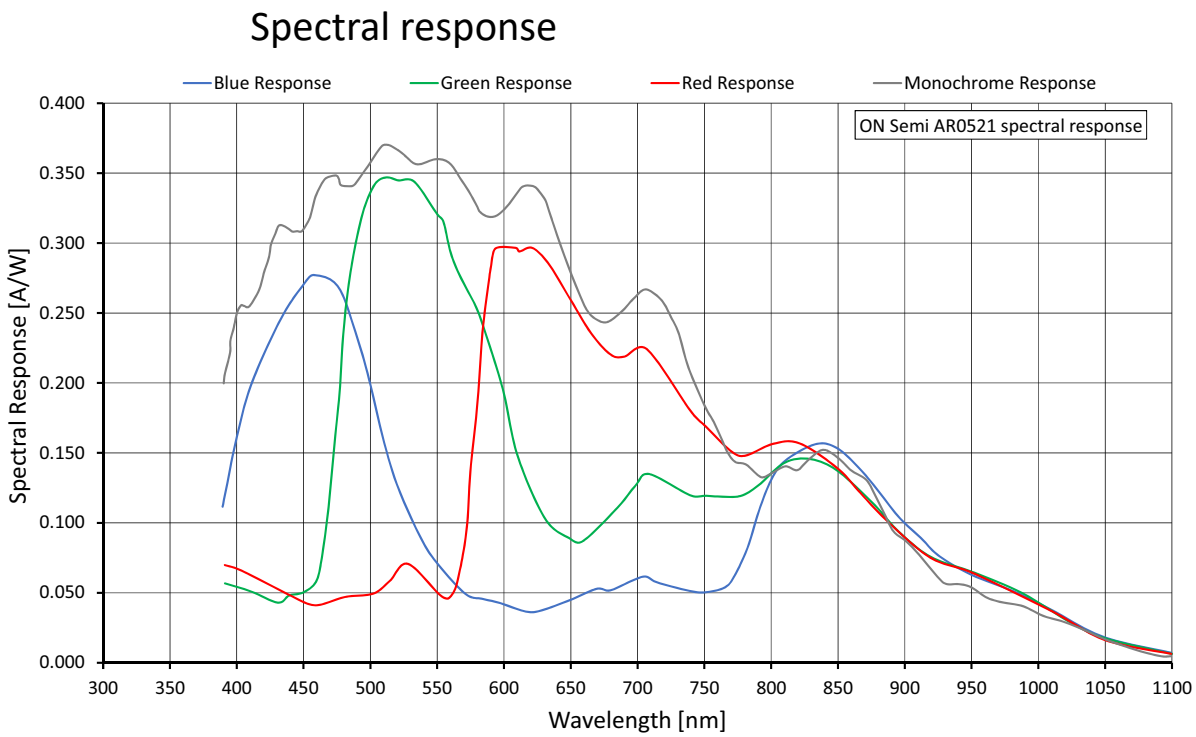


Figure 23: Alvium 1800 U-500m/c (ON Semi AR0521SR) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

When rolling shutter cameras are **operated in triggered mode**, the values for maximum frame rate reached in free run mode are cut in half.

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2592	1944	5.039	68.1 / 43.6	68.1 / 36.3	38.8 / 19.4
WQHD	2560	1440	3.686	91.2 / 59.0	91.2 / 49.3	52.5 / 26.4
QXGA	2048	1536	3.146	85.8 / 69.4	85.8 / 57.9	61.7 / 30.9
Full HD	1920	1080	2.074	120.5 / 103.9	120.5 / 86.7	92.4 / 46.4
UXGA	1600	1200	1.920	109.1 / 109.1	109.1 / 94.1	100.2 / 50.3
WXGA+	1440	900	1.296	143.8 / 143.8	143.8 / 137.6	143.8 / 73.7
SXGA	1280	1024	1.311	127.3 / 127.3		127.3 / 73.3
HD 720	1280	720	0.922	177.8 / 177.8		177.8 / 102.5
XGA	1024	768	0.786	167.7 / 167.7		167.7 / 120.5
SVGA	800	600	0.480	212.1 / 212.1		212.1 / 194.7
VGA	640	480	0.307	261.4 / 261.4		
HVGA	480	320	0.154	378.3 / 378.3		
QVGA	320	240	0.077	488.1 / 488.1		
HQVGA	240	160	0.038	684.2 / 684.2		
QQVGA	160	120	0.019	856.3 / 856.3		
Max. × half	2592	972	2.519	132.6 / 85.1	132.6 / 71.0	75.7 / 38.0
Max. × min.	2592	8	0.021	2160.6 / 1550.0	2160.6 / 1339.0	1402.8 / 771.4
Min. × max.	8	1944	0.016	68.7 / 68.7		
Min. × min.	8	8	64 P	2895.6 / 2895.6		

[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 40: 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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerGR8, BayerGR10, BayerGR10p, BGR8, RGB8 (default)
Maximum frame rate	68 fps[1] (at ≥375 MBps)	
Exposure time	8 µs to 0.4 s (375 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.4 W	
[1] In triggered mode: 34 fps		

Table 41: Alvium 1800 U-501m/c NIR specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-501m/c NIR (monochrome)			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[2]**	**Mainboard[3]**
	Bare board[4]	Not applicable	-20 °C to +85 °C	-20 °C to +85 °C
	Open housing[5]	-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 V2.0 (GenICam Access)			

[2] See Mounting the heat sink on page 199.

[3] Output by `DeviceTemperature`

[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.

[5] Temperature values must be observed for the housing **and** for the cooling areas.

Table 41: Alvium 1800 U-501m/c NIR specifications (sheet 2 of 2)

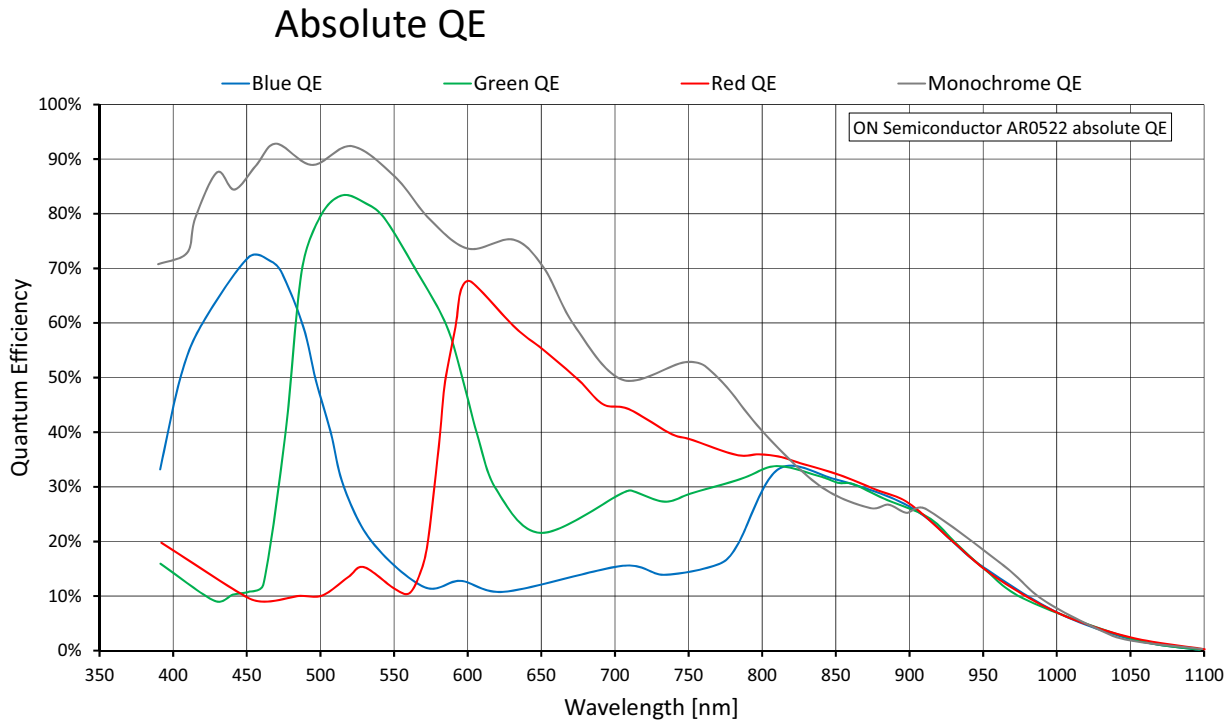


Figure 24: Alvium 1800 U-501m/c NIR (ON Semi AR0522) absolute QE

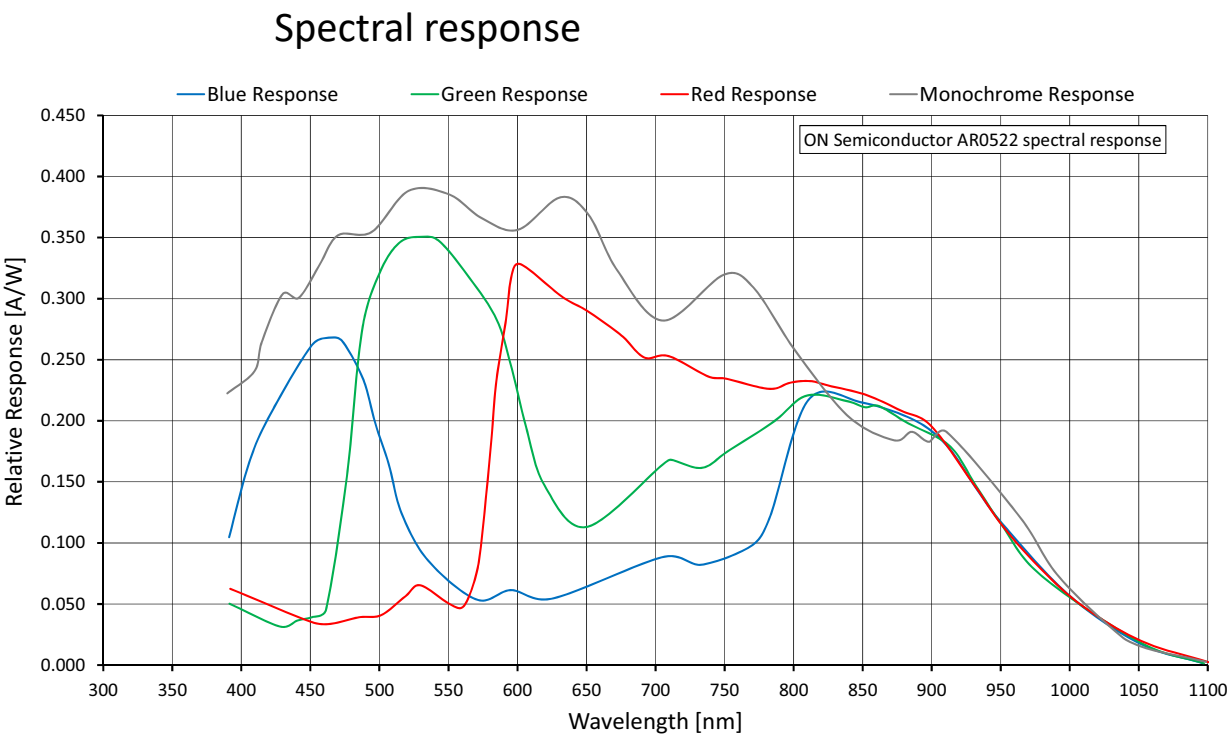


Figure 25: Alvium 1800 U-501m/c NIR (ON Semi AR0522) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

When rolling shutter cameras are **operated in triggered mode**, the values for maximum frame rate reached in free run mode are cut in half.

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2592	1944	5.039	68.1 / 43.6	68.1 / 36.3	38.8 / 19.4
WQHD	2560	1440	3.686	91.2 / 59.0	91.2 / 49.3	52.5 / 26.4
QXGA	2048	1536	3.146	85.8 / 69.4	85.8 / 57.9	61.7 / 30.9
Full HD	1920	1080	2.074	120.5 / 103.9	120.5 / 86.7	92.4 / 46.4
UXGA	1600	1200	1.920	109.1 / 109.1	109.1 / 94.1	100.2 / 50.3
WXGA+	1440	900	1.296	143.8 / 143.8	143.8 / 137.6	143.8 / 73.7
SXGA	1280	1024	1.311	127.3 / 127.3		127.3 / 73.3
HD 720	1280	720	0.922	177.8 / 177.8		177.8 / 102.5
XGA	1024	768	0.786	167.7 / 167.7		167.7 / 120.5
SVGA	800	600	0.480	212.1 / 212.1		212.1 / 194.7
VGA	640	480	0.307	261.4 / 261.4		
HVGA	480	320	0.154	378.3 / 378.3		
QVGA	320	240	0.077	488.1 / 488.1		
HQVGA	240	160	0.038	684.2 / 684.2		
QQVGA	160	120	0.019	856.3 / 856.3		
Max. × half	2592	972	2.519	132.6 / 85.1	132.6 / 71.0	75.7 / 38.0
Max. × min.	2592	8	0.021	2160.6 / 1550.0	2160.6 / 1339.0	1402.8 / 771.4
Min. × max.	8	1944	0.016	68.7 / 68.7		
Min. × min.	8	8	64 P	2895.6 / 2895.6		

[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 42: 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	34 fps (at ≥200 MBps)	
Exposure time	41 µs to 10 s (200 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 2.2 W	

Table 43: Alvium 1800 U-507m/c 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 areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 43: Alvium 1800 U-507m/c specifications (sheet 2 of 2)

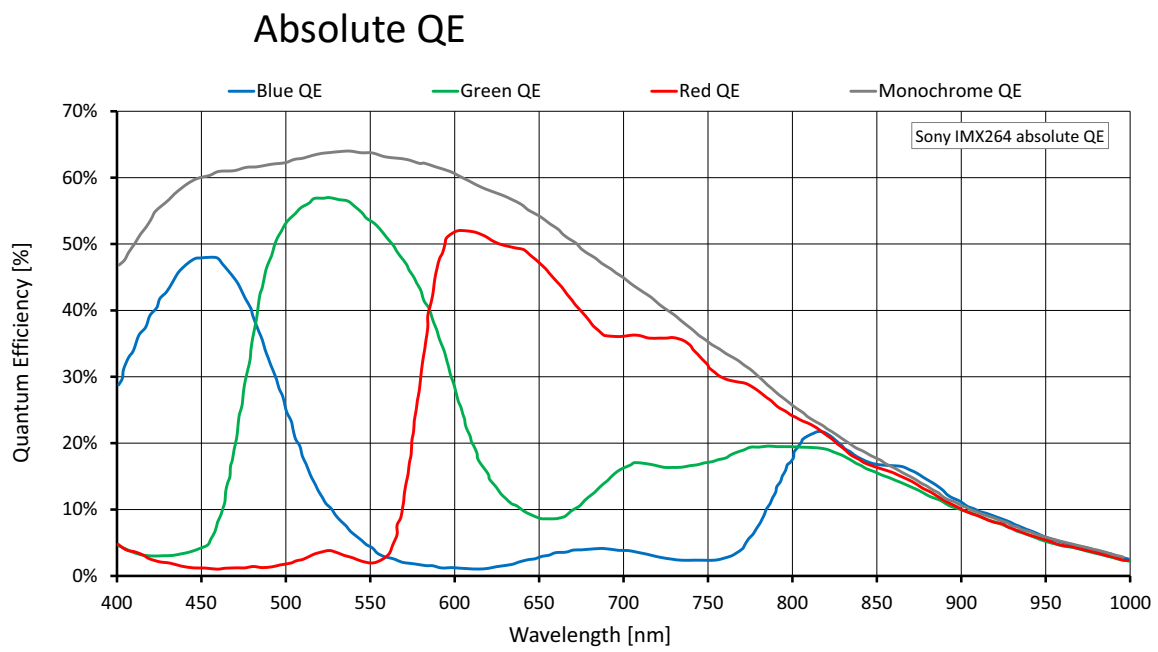


Figure 26: Alvium 1800 U-507m/c (Sony IMX264) absolute QE

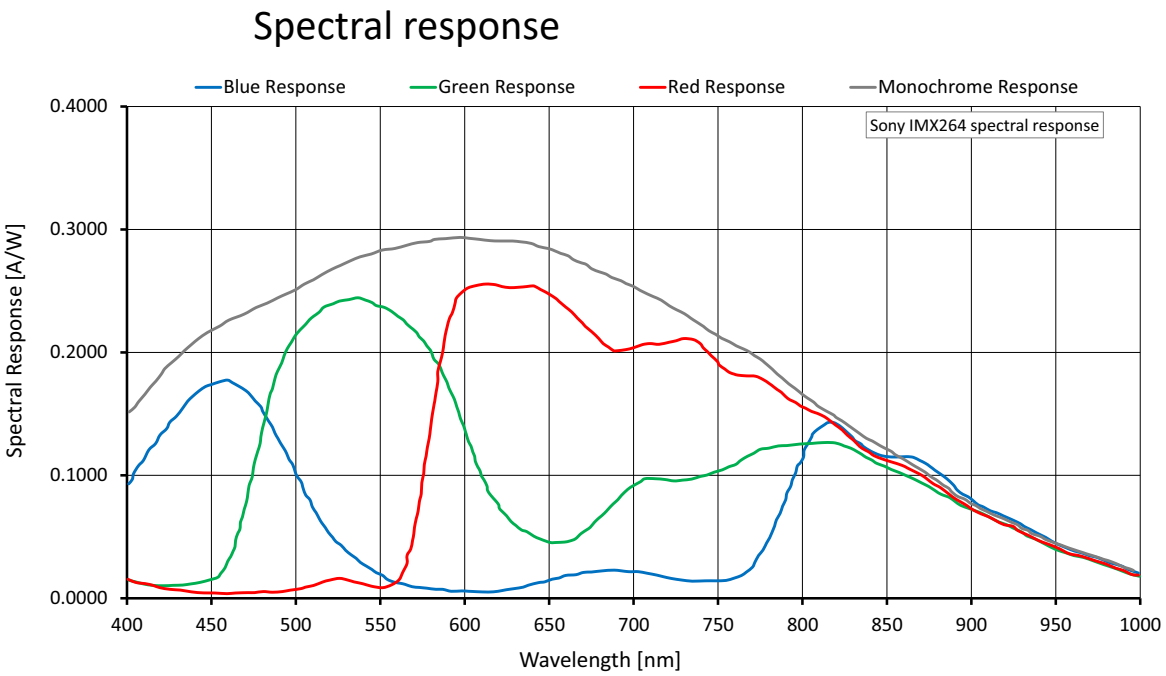


Figure 27: Alvium 1800 U-507m/c (Sony IMX264) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
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	1.920	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		
HD 720	1280	720	0.922	95.5 / 95.5		
XGA	1024	768	0.786	90.2 / 90.2		
SVGA	800	600	0.480	113.7 / 113.7		
VGA	640	480	0.307	139.6 / 139.6		
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	0.020	1015.1 / 1015.1		1015.1 / 634.0
Min. × max.	8	2056	0.016	35.2 / 35.2		
Min. × min.	8	8	64 P	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 44: Alvium 1800 U-507m/c 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	85 fps (at 450 MBps)	
Exposure time	27 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.1 W	

Table 45: Alvium 1800 U-508m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-508m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 45: Alvium 1800 U-508m/c specifications (sheet 2 of 2)

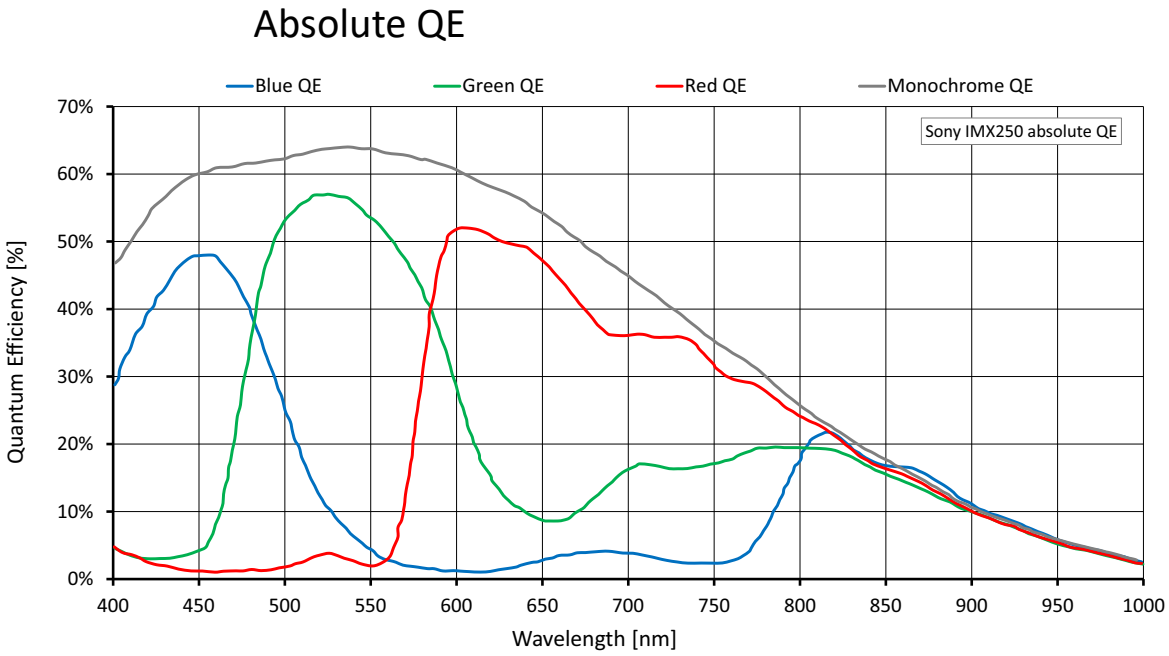


Figure 28: Alvium 1800 U-508m/c (Sony IMX250) absolute QE

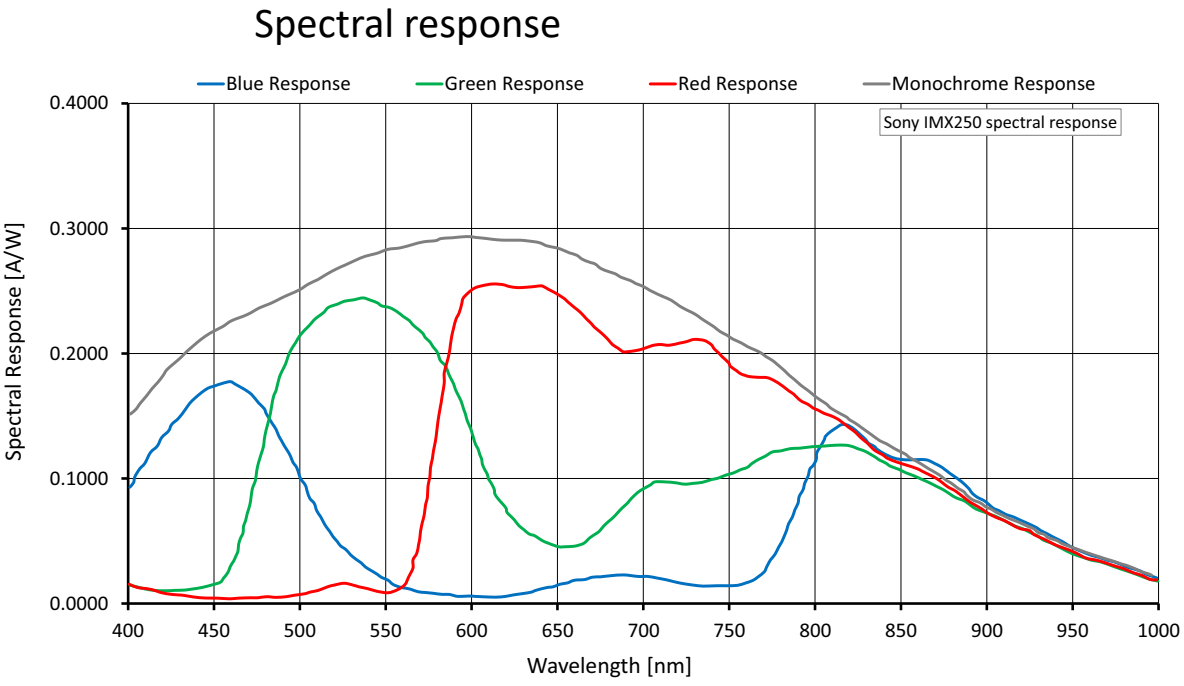


Figure 29: Alvium 1800 U-508m/c (Sony IMX250) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2464	2056	5.066	85.0 / 42.8 / 42.7	71.3 / 35.7 / 35.7	38.2 / 19.2 / 19.2
QXGA	2048	1536	3.146	126.1 / 68.0 / 67.9	112.7 / 56.8 / 56.6	60.7 / 30.5 / 30.5
Full HD	1920	1080	2.074	175.8 / 101.6 / 101.0	166.8 / 84.6 / 84.7	90.7 / 45.6 / 45.6
UXGA	1600	1200	1.920	160.0 / 110.2 / 110.2	160.0 / 92.3 / 91.8	98.6 / 49.6 / 49.6
WXGA+	1440	900	1.296	209.9 / 159.3 / 146.2	209.9 / 133.5 / 132.8	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 / 71.9 / 71.8
HD 720	1280	720	0.922	258.2 / 211.2 / 179.8	258.2 / 185.0 / 179.8	199.0 / 99.9 / 99.8
XGA	1024	768	0.786	244.9 / 200.1 / 170.6		232.4 / 117.5 / 117.7
SVGA	800	600	0.480	308.6 / 252.1 / 214.9		308.6 / 189.7 / 189.4
VGA	640	480	0.307	378.4 / 309.6 / 263.9		378.4 / 287.5 / 263.9
HVGA	480	320	0.154	541.1 / 443.8 / 378.3		
QVGA	320	240	0.077	686.8 / 569.5 / 483.8		
HQVGA	240	160	0.038	940.0 / 787.0 / 667.8		
QQVGA	160	120	0.019	1152.5 / 970.1 / 822.2		
Max. × half	2464	1028	2.533	163.5 / 82.9 / 82.4	137.4 / 69.2 / 69.1	74.2 / 37.4 / 37.3
Max. × min.	2464	8	0.020	1956.8 / 1153.2 / 1083.2	1748.9 / 1010.2 / 961.0	1125.8 / 614.8 / 596.7
Min. × max.	8	2056	0.016	96.5 / 79.2 / 67.4		
Min. × min.	8	8	64 P	3138.2 / 2780.9 / 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 54 for details.

Table 46: Alvium 1800 U-508m/c ROI frame rates

Alvium 1800 U-511m/c

Feature	Specification	
	1800 U-511m (monochrome)	**1800 U-511c (color)**
Sensor model	Sony IMX547	
Resolution	2464 (H) × 2064 (V); 5.1 MP	
Sensor type	CMOS	
Shutter type	Global shutter (GS)	
Sensor size	Type 1/1.8; 6.75 mm × 5.66 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	79 fps (at 450 MBps)	
Exposure time	16 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.4 W	

Table 47: Alvium 1800 U-511m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-511m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 47: Alvium 1800 U-511m/c specifications (sheet 2 of 2)

Absolute QE

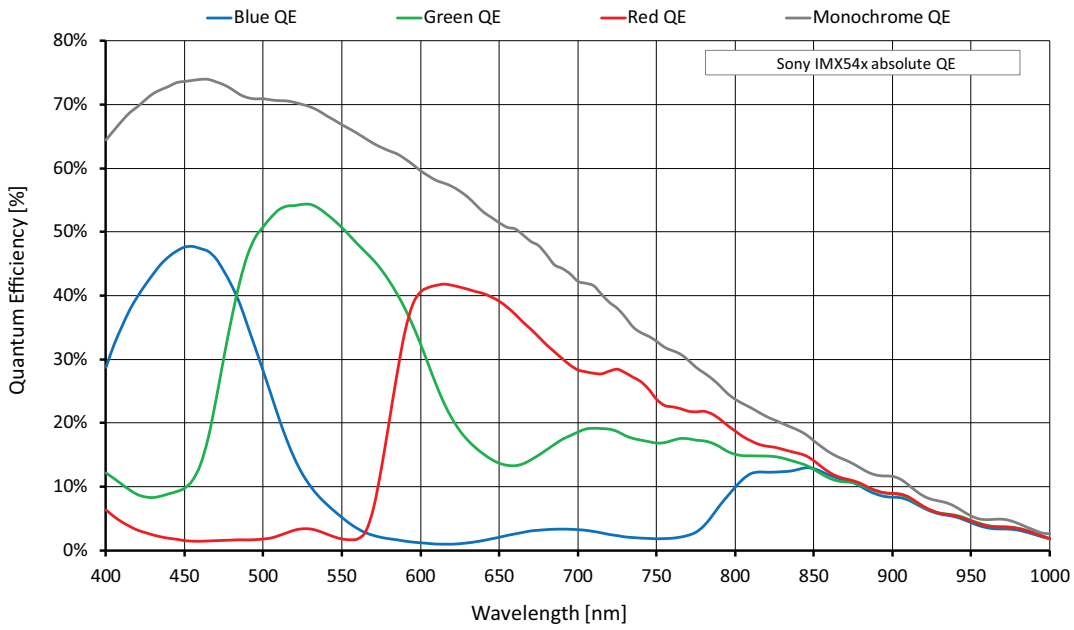


Figure 30: Alvium 1800 U-511m/c (Sony IMX547) absolute QE

Spectral response

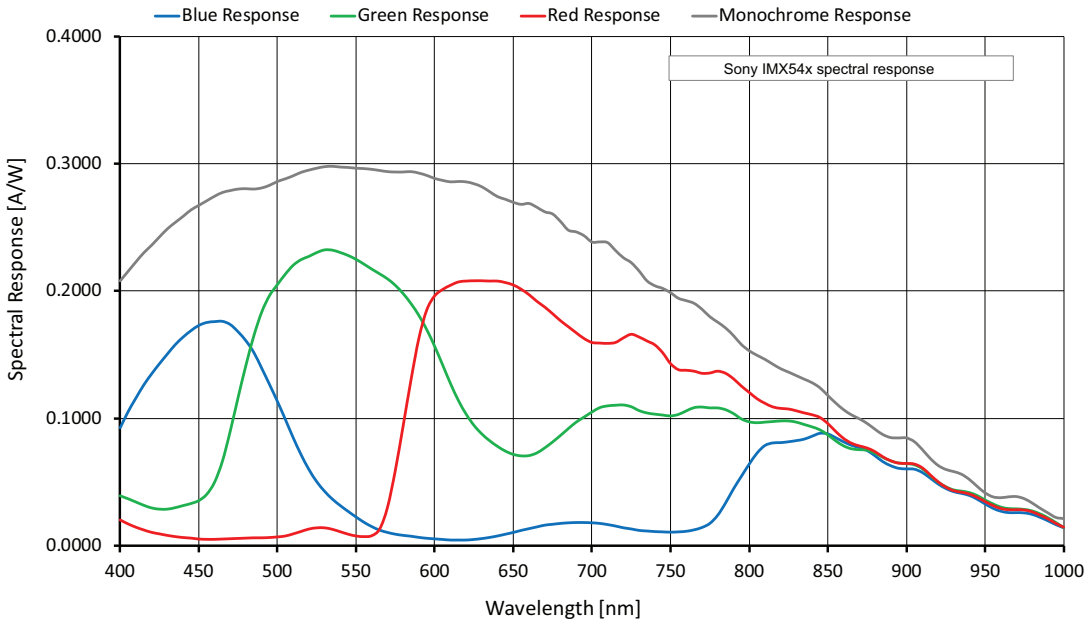


Figure 31: Alvium 1800 U-511m/c (Sony IMX547) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2464	2064	5.086	79.9 / 40.7	67.7 / 34.1	36.3 / 18.2
QXGA	2048	1536	3.146	104.8 / 64.3	104.8 / 53.6	57.0 / 28.7
Full HD	1920	1080	2.074	142.8 / 93.2	142.8 / 77.8	83.0 / 41.9
UXGA	1600	1200	1.920	130.8 / 102.5	130.8 / 85.3	90.9 / 45.9
WXGA+	1440	900	1.296	167.0 / 145.0	167.0 / 121.0	129.0 / 65.0
SXGA	1280	1024	1.311	150.6 / 146.4	150.6 / 122.5	130.6 / 65.8
HD 720	1280	720	0.922	201.8 / 196.3	201.8 / 164.4	175.3 / 88.4
XGA	1024	768	0.786	192.3 / 192.3		192.3 / 104.5
SVGA	800	600	0.480	235.3 / 235.3		235.3 / 163.5
VGA	640	480	0.307	280.3 / 280.3		280.3 / 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 / 558.0		558.0 / 510.1
QQVGA	160	120	0.019	636.8 / 636.8		636.8 / 582.5
Max. × half	2464	1032	2.543	147.4 / 75.6	125.0 / 63.3	67.4 / 33.9
Max. × min.	2464	8	0.020	905.6 / 505.5	788.4 / 429.8	455.4 / 238.4
Min. × max.	8	2064	0.017	80.9 / 80.9		80.9 / 73.8
Min. × min.	8	8	64 P	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 48: Alvium 1800 U-511m/c 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	51 fps (at 450 MBps)	
Exposure time	18 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.5 W	

Table 49: Alvium 1800 U-811m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-811m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 49: Alvium 1800 U-811m/c specifications (sheet 2 of 2)

Absolute QE

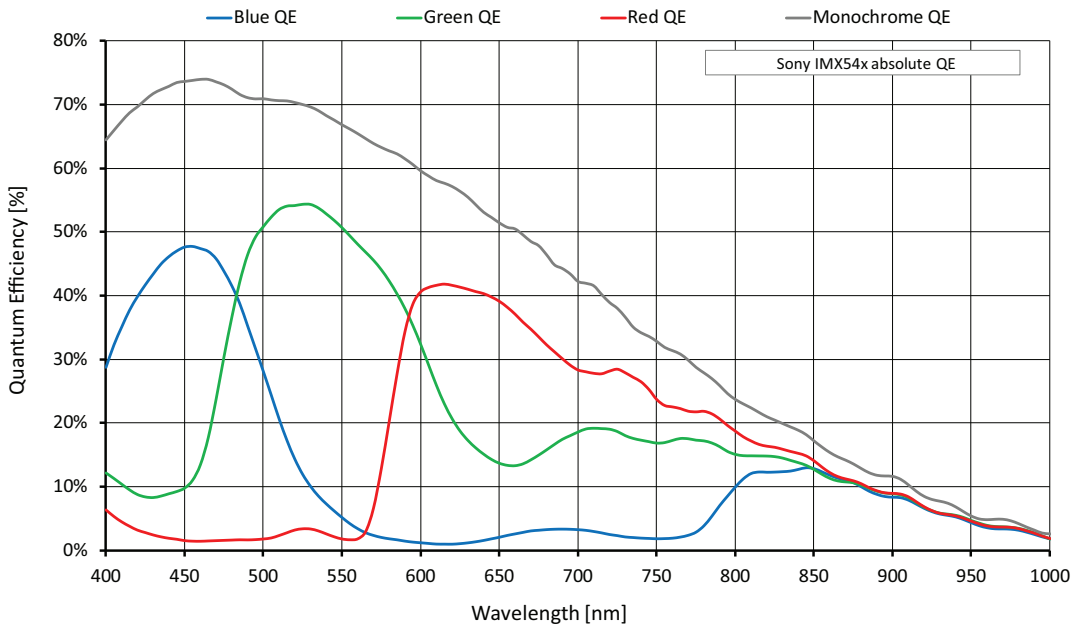


Figure 32: Alvium 1800 U-811m/c (Sony IMX546) absolute QE

Spectral response

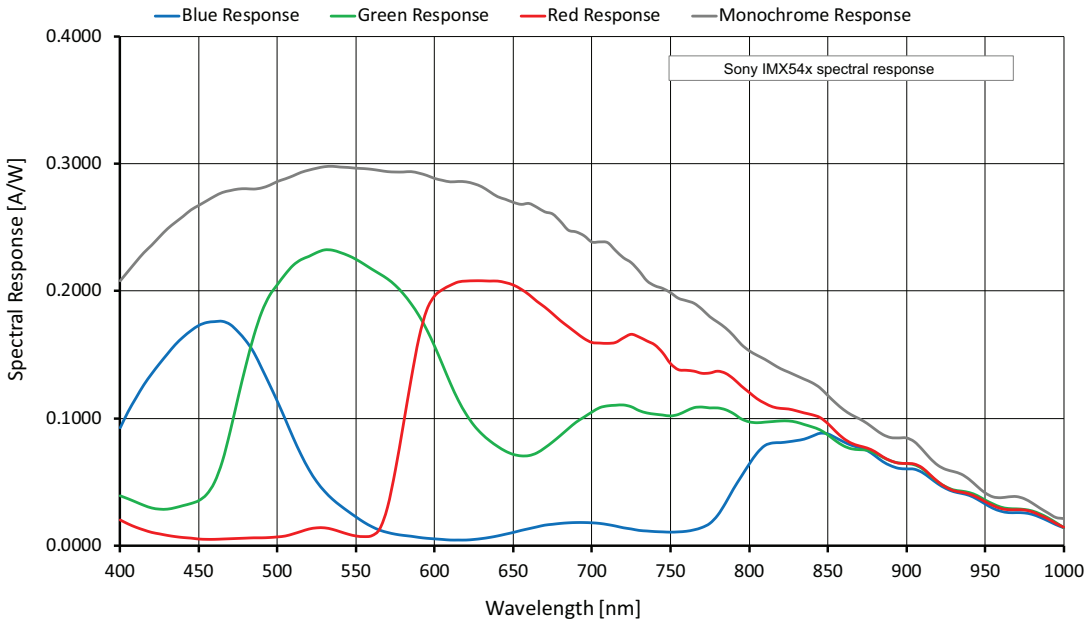


Figure 33: Alvium 1800 U-811m/c (Sony IMX546) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2848	2848	8.111	51.8 / 26.2	43.4 / 21.8	23.2 / 11.7
QSXGA	2560	2048	5.243	78.2 / 39.4	65.5 / 33.0	35.2 / 17.6
WQHD	2560	1440	3.686	107.4 / 54.3	90.0 / 45.4	48.4 / 24.3
QXGA	2048	1536	3.146	104.8 / 64.3	104.8 / 53.6	57.0 / 28.7
Full HD	1920	1080	2.074	142.8 / 93.2	142.8 / 77.8	83.0 / 41.9
UXGA	1600	1200	1.920	130.8 / 102.5	130.8 / 85.3	90.9 / 45.9
WXGA+	1440	900	1.296	167.0 / 145.0	167.0 / 121.0	129.0 / 65.0
SXGA	1280	1024	1.311	150.6 / 146.4	150.6 / 122.5	130.6 / 65.8
HD 720	1280	720	0.922	201.8 / 196.3	201.8 / 164.4	175.3 / 88.4
XGA	1024	768	0.786	192.3 / 192.3		192.3 / 104.5
SVGA	800	600	0.480	235.3 / 235.3		235.3 / 163.5
VGA	640	480	0.307	280.3 / 280.3		280.3 / 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 / 558.0		558.0 / 510.1
QQVGA	160	120	0.019	636.8 / 636.8		636.8 / 582.5
Max. × half	2848	1424	4.056	97.4 / 49.5	81.8 / 41.3	43.9 / 22.1
Max. × min.	2848	8	0.023	790.5 / 438.8	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 P	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 50: Alvium 1800 U-811m/c ROI frame rates

Alvium 1800 U-812 UV (coming soon)

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 MBps)
Exposure time	18 µs to 10 s (450 MBps)
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
Image buffer (RAM)	256 KB
Non-volatile memory (Flash)	1024 KB
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.1 W

Table 51: 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 areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 51: Alvium 1800 U-812 UV specifications (sheet 2 of 2)

Absolute QE

Diagrams will be added in a future version of this document.

Spectral response

Diagrams will be added in a future version of this document.

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	2848	2848	8.111	51.4 / 26.0	43.1 / 21.7	23.1 / 11.6
QSXGA	2560	2048	5.243	77.5 / 39.1	64.9 / 32.7	34.9 / 17.5
WQHD	2560	1440	3.686	106.1 / 53.6	88.8 / 44.9	47.9 / 24.0
QXGA	2048	1536	3.146	103.6 / 63.6	103.6 / 53.0	56.3 / 28.4
Full HD	1920	1080	2.074	139.7 / 91.2	139.7 / 76.1	81.1 / 40.9
UXGA	1600	1200	1.920	128.9 / 101.0	128.9 / 84.0	89.6 / 45.2
WXGA+	1440	900	1.296	162.8 / 141.3	162.8 / 117.9	125.7 / 63.3
SXGA	1280	1024	1.311	148.1 / 144.0	148.1 / 120.5	128.5 / 64.7
HD 720	1280	720	0.922	197.4 / 192.0	197.4 / 160.8	171.4 / 86.5
XGA	1024	768	0.786	188.3 / 188.3		188.3 / 102.3
SVGA	800	600	0.480	227.0 / 227.0		227.0 / 157.7
VGA	640	480	0.307	271.8 / 271.8		271.8 / 235.6
HVGA	480	320	0.154	358.3 / 358.3		358.3 / 327.2
QVGA	320	240	0.077	426.1 / 426.1		426.1 / 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	96.2 / 48.9	80.8 / 40.8	43.4 / 21.9
Max. × min.	2848	8	0.023	693.0 / 379.8	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 P	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 52: Alvium 1800 U-812 UV 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	23 fps (at ≥300 MBps)	
Exposure time	43 µs to 10 s (300 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.1 W	

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

Table 53: Alvium 1800 U-1236m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-1236m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[1]**	**Mainboard[2]**
	Bare board[3]	Not applicable	-20 °C to +85 °C	+5 °C to +88 °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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 53: Alvium 1800 U-1236m/c specifications (sheet 2 of 2)

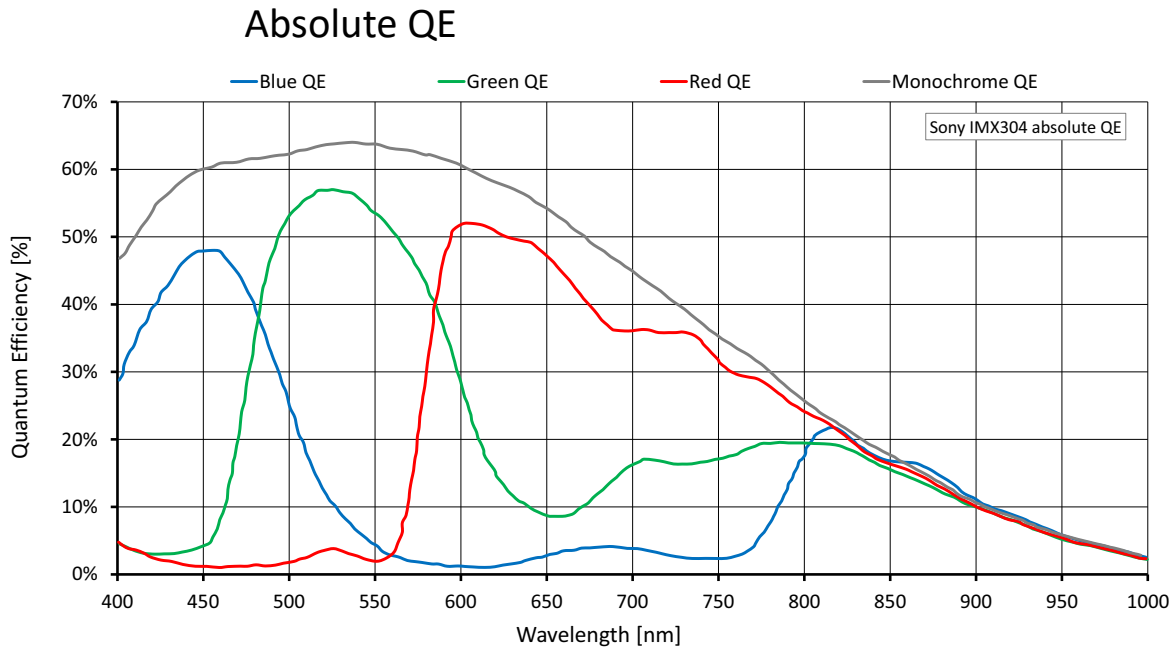


Figure 34: Alvium 1800 U-1236m/c (Sony IMX304) absolute QE

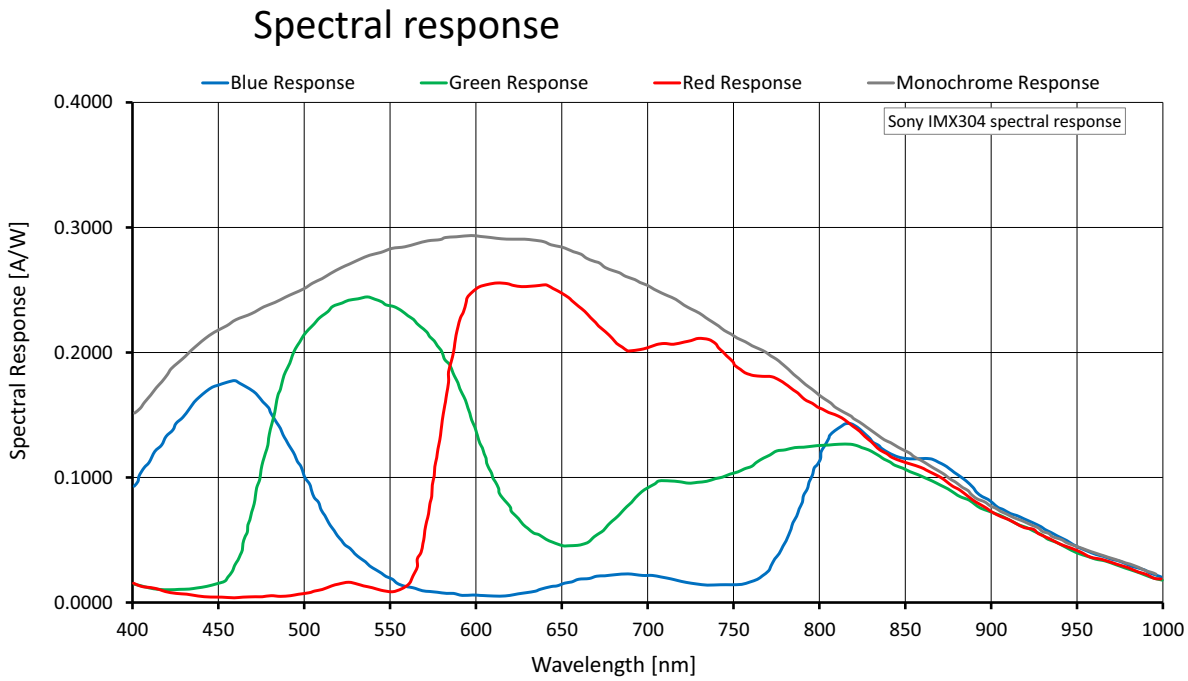


Figure 35: Alvium 1800 U-1236m/c (Sony IMX304) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	4112	3008	12.369	23.0 / 17.7	23.0 / 14.8	15.8 / 7.9
UHD 4K	3840	2160	8.294	31.7 / 26.1	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	1.920	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	0.480	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 / 34.5	44.7 / 28.9	30.8 / 15.5
Max. × min.	4112	8	0.033	756.6 / 641.4	756.6 / 561.7	591.8 / 347.3
Min. × max.	8	3008	0.024	23.2 / 23.2		
Min. × min.	8	8	64 P	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 54: 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; 9.33 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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerRG8, BayerRG10, BayerRG10p, BGR8, RGB8 (default)
Maximum frame rate	35 fps[1] (at 450 MBps)	
Exposure time	13 µs to 10 s (450 MBps)	
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 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.3 W	

[1] In triggered mode: 17 fps

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

Table 55: Alvium 1800 U-1240m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-1240m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[2]**	**Mainboard[3]**
	Bare board[4]	Not applicable	-20 °C to +85 °C	+5 °C to +88 °C
	Open housing[5]	-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 V2.0 (GenICam Access)			

[2] See Mounting the heat sink on page 199.

[3] Output by `DeviceTemperature`

[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.

[5] Temperature values must be observed for the housing **and** for the cooling areas.

Table 55: Alvium 1800 U-1240m/c specifications (sheet 2 of 2)

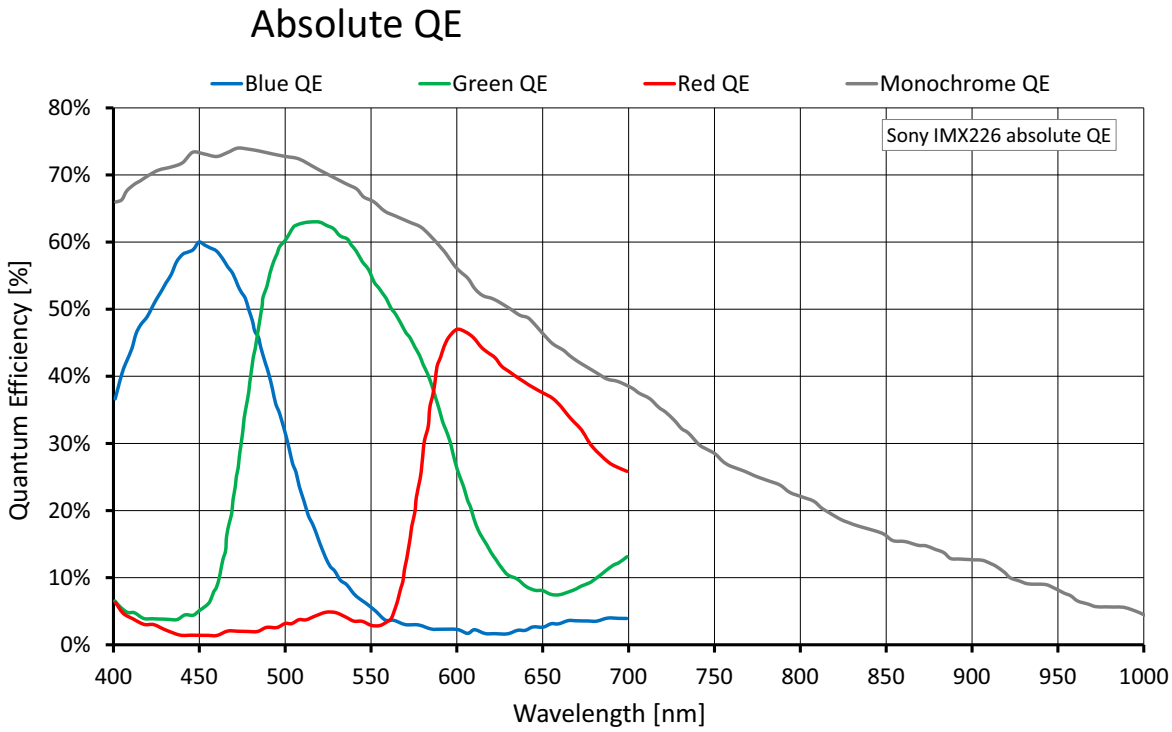


Figure 36: Alvium 1800 U-1240m/c (Sony IMX226) absolute QE

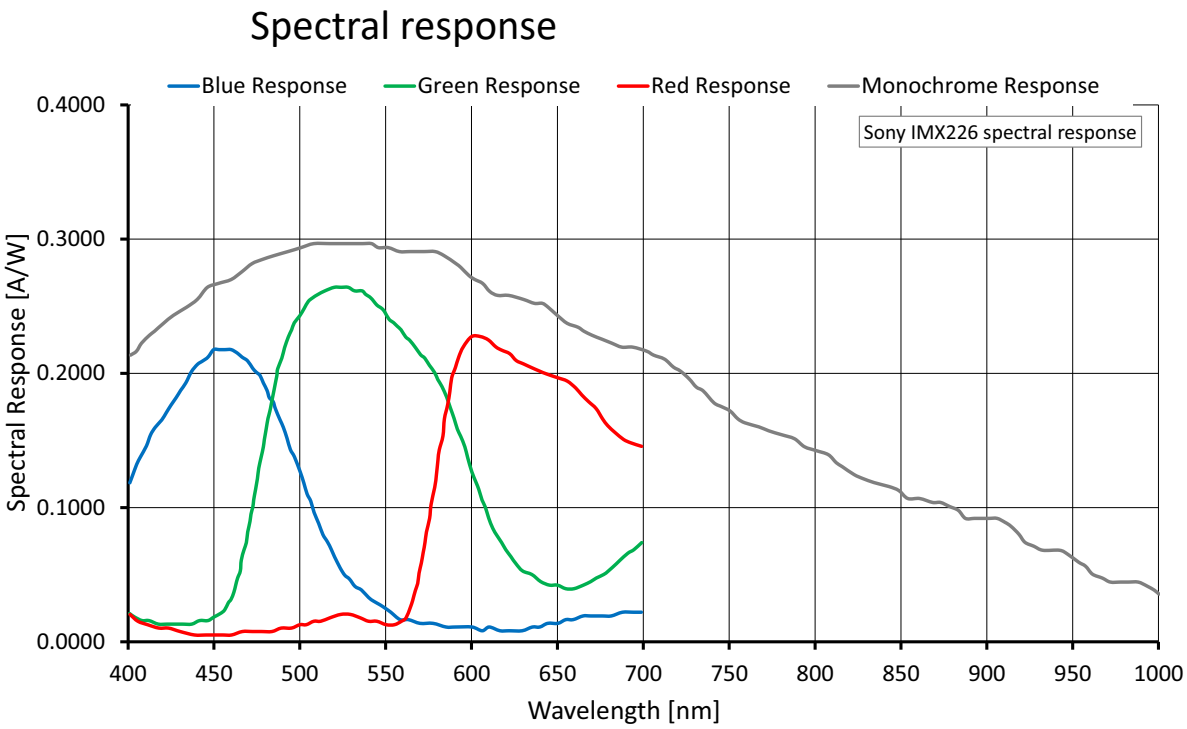


Figure 37: Alvium 1800 U-1240m/c (Sony IMX226) spectral response

ROI frame rates

Values were calculated for rolling shutter (RS) mode as defined in Specified values on page 54.

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

When rolling shutter cameras are **operated in triggered mode**, the values for maximum frame rate reached in free run mode are cut in half.

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	4024	3036	12.217	35.5 / 17.9	29.6 / 14.9	15.9 / 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 P			

[1] Mono8 or Bayer...8[(2)] at `SensorBitDepth` = 8-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 56: 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; 11.31 mm × 8.24 mm; 14 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	34 fps (at 450 MBps)	
Exposure time	25 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.6 W	

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

Table 57: Alvium 1800 U-1242m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-1242m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 57: Alvium 1800 U-1242m/c specifications (sheet 2 of 2)

Absolute QE

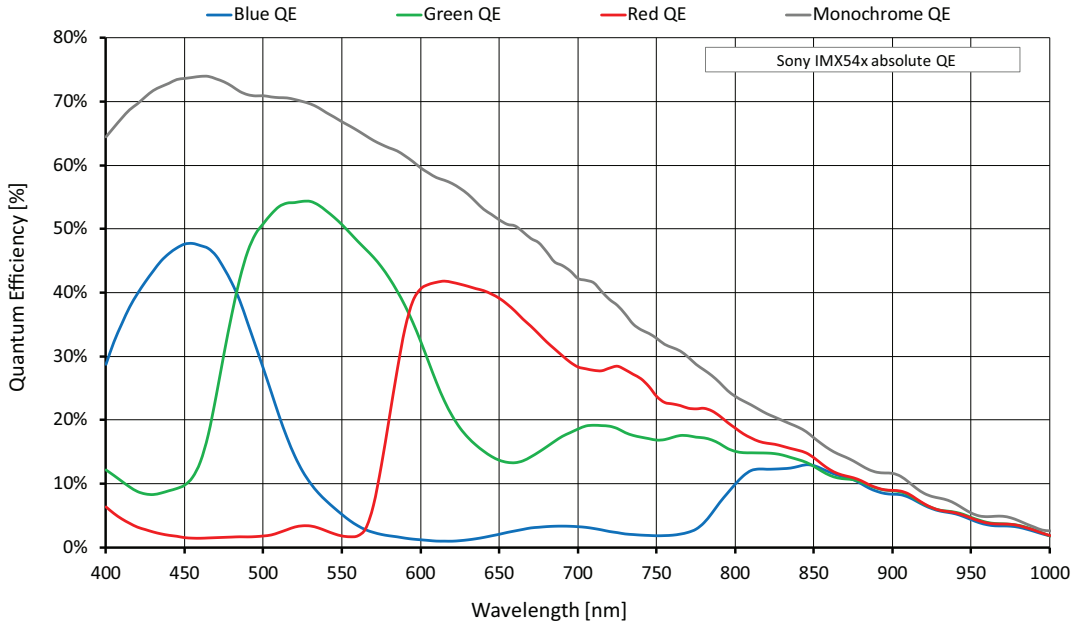


Figure 38: Alvium 1800 U-1242m/c (Sony IMX545) absolute QE

Spectral response

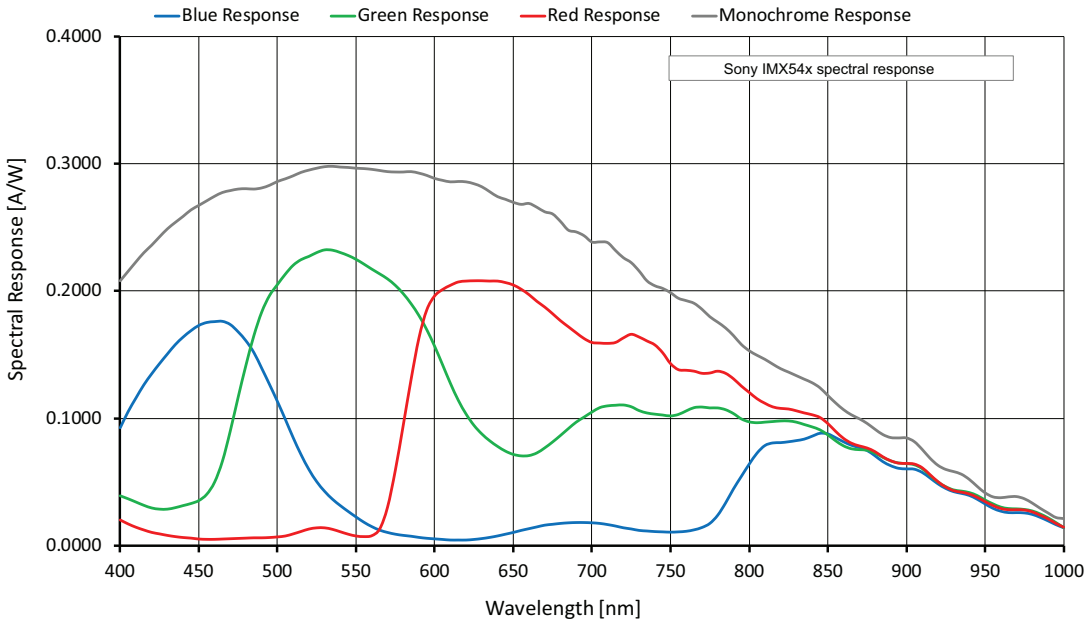


Figure 39: Alvium 1800 U-1242m/c (Sony IMX545) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	4128	3008	12.417	34.1 / 17.2	28.5 / 14.4	15.3 / 7.6
UHD 4K	3840	2160	8.294	50.0 / 25.3	41.7 / 21.1	22.5 / 11.3
QSXGA	2560	2048	5.243	59.1 / 39.7	59.1 / 33.2	35.4 / 17.8
WQHD	2560	1440	3.686	81.5 / 54.9	81.5 / 45.9	48.9 / 24.6
QXGA	2048	1536	3.146	77.1 / 64.9	77.1 / 54.1	57.5 / 29.0
Full HD	1920	1080	2.074	105.5 / 94.5	105.5 / 78.8	84.0 / 42.4
UXGA	1600	1200	1.920	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 / 106.3
SVGA	800	600	0.480	175.2 / 175.2		175.2 / 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	64.7 / 32.8	54.1 / 27.4	29.2 / 14.7
Max. × min.	4128	8	0.033	593.2 / 331.9	511.6 / 281.9	298.4 / 157.2
Min. × max.	8	3008	0.024	41.5 / 41.5		
Min. × min.	8	8	64 P	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 58: 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 × 8.33 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	26 fps (at 450 MBps)	
Exposure time	31 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.2 W	

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

Table 59: 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 areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 59: Alvium 1800 U-1620m/c specifications (sheet 2 of 2)

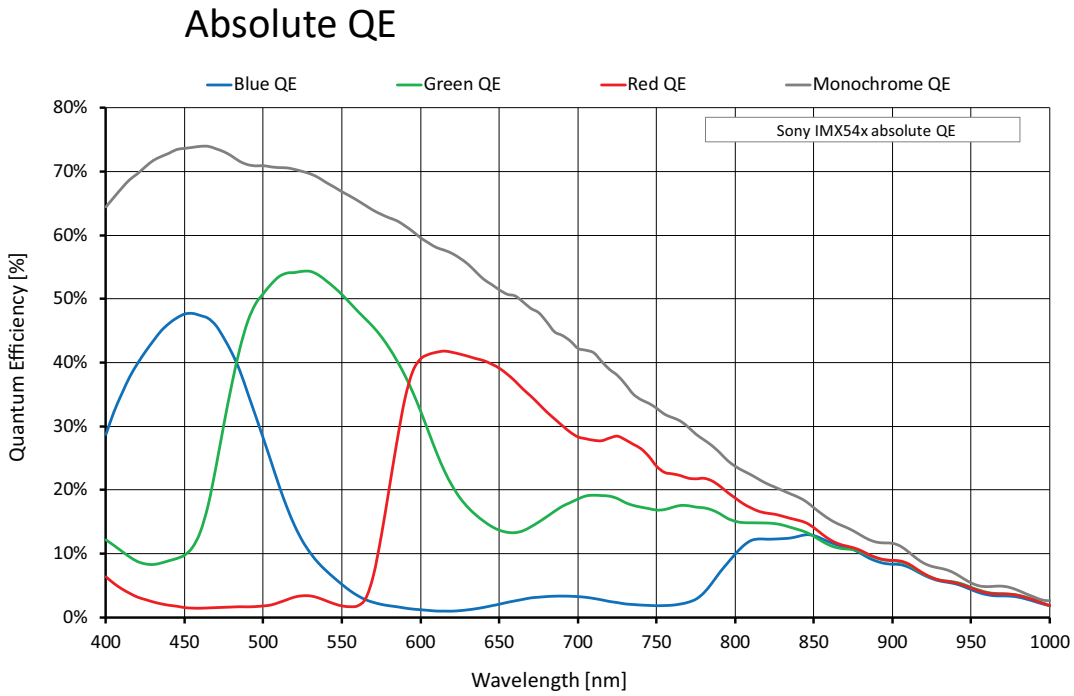


Figure 40: Alvium 1800 U-1620m/c (Sony IMX542) absolute QE

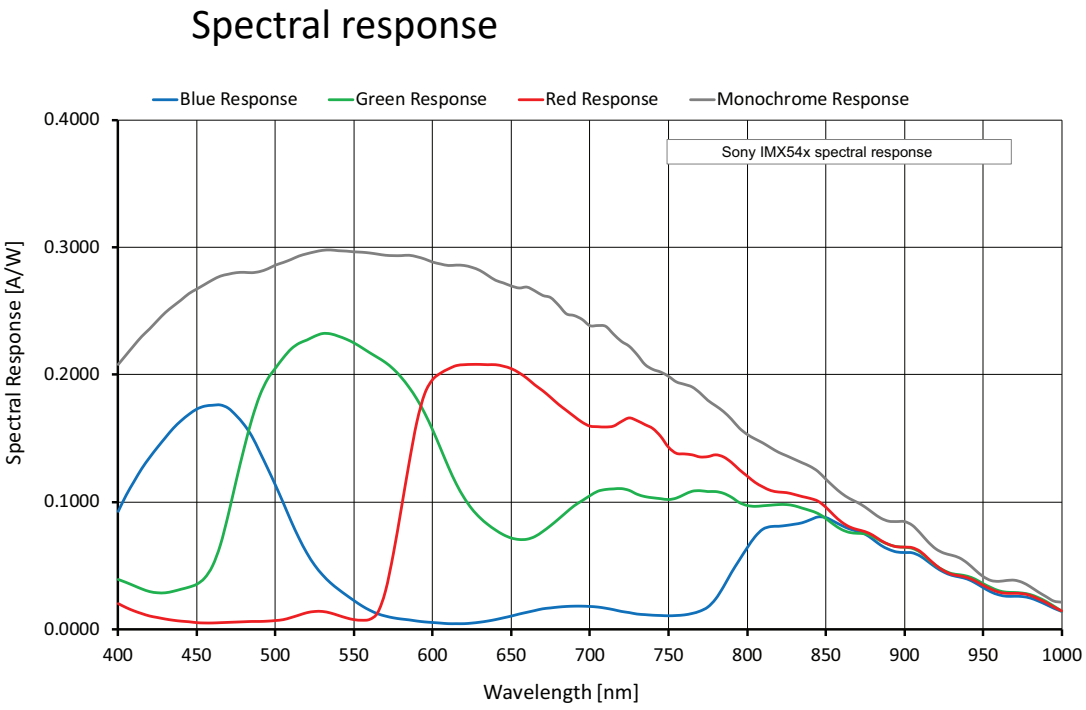


Figure 41: Alvium 1800 U-1620m/c (Sony IMX542) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	5312	3040	16.148	26.4 / 13.3	22.1 / 11.1	11.8 / 5.9
UHD 4K	3840	2160	8.294	44.6 / 25.5	42.1 / 21.2	22.7 / 11.4
QSXGA	2560	2048	5.243	47.1 / 40.1	47.1 / 33.5	35.7 / 17.9
WQHD	2560	1440	3.686	65.3 / 55.6	65.3 / 46.5	49.5 / 24.9
QXGA	2048	1536	3.146	61.7 / 61.7	61.7 / 54.8	58.2 / 29.3
Full HD	1920	1080	2.074	85.0 / 85.0	85.0 / 80.1	85.0 / 43.1
UXGA	1600	1200	1.920	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	115.3 / 115.3		115.3 / 108.7
SVGA	800	600	0.480	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	5312	1520	8.074	50.4 / 25.5	42.3 / 21.4	22.7 / 11.4
Max. × min.	5312	8	0.042	517.6 / 293.6	449.6 / 250.3	264.6 / 140.3
Min. × max.	8	3040	0.024	32.6 / 32.6		
Min. × min.	8	8	64 P	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 60: 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; 12.36 mm × 12.36 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	21 fps (at 450 MBps)	
Exposure time	27 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.1 W	
[1] Digital vertical binning can be used only when digital horizontal binning is used as well.		

Table 61: Alvium 1800 U-2040m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-2040m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[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 V2.0 (GenICam Access)			

[1] See Mounting the heat sink on page 199.

[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 areas.

Table 61: Alvium 1800 U-2040m/c specifications (sheet 2 of 2)

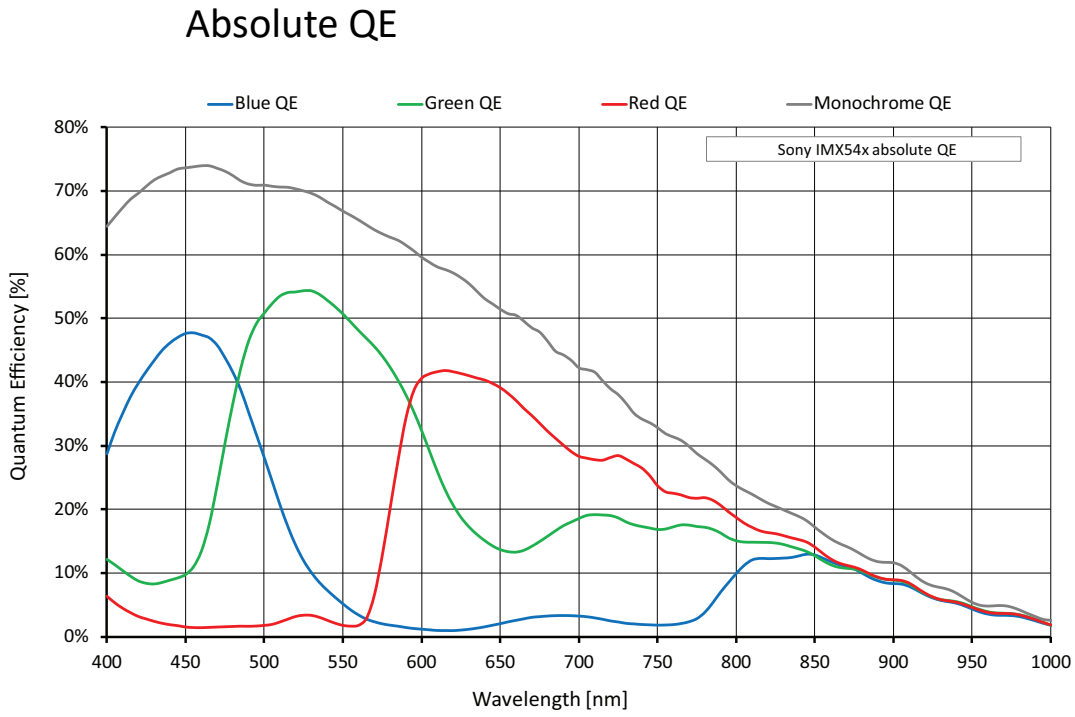


Figure 42: Alvium 1800 U-2040m/c (Sony IMX541) absolute QE

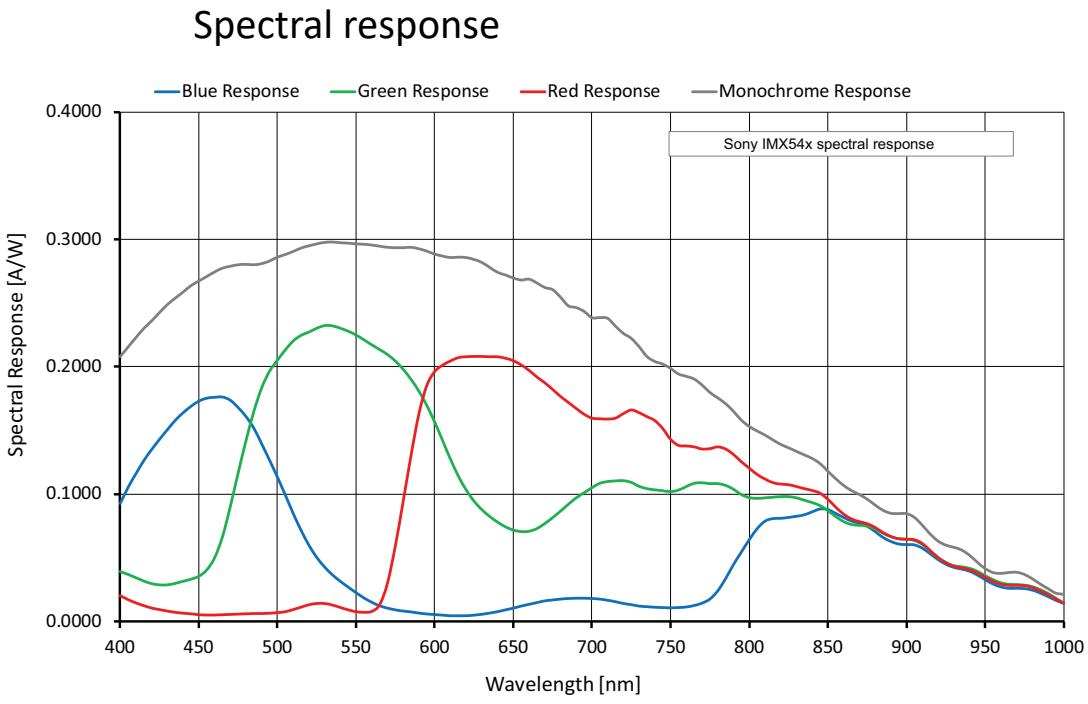


Figure 43: Alvium 1800 U-2040m/c (Sony IMX541) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	4512	4512	20.358	21.3 / 10.7	17.8 / 8.9	9.5 / 4.7
HXGA	4096	3072	12.583	34.0 / 17.1	28.4 / 14.3	15.2 / 7.6
UHD 4K	3840	2160	8.294	50.4 / 25.5	42.0 / 21.2	22.6 / 11.4
QSXGA	2560	2048	5.243	55.0 / 40.0	55.0 / 33.5	35.7 / 17.9
WQHD	2560	1440	3.686	76.0 / 55.5	76.0 / 46.4	49.5 / 24.9
QXGA	2048	1536	3.146	71.9 / 65.6	71.9 / 54.7	58.1 / 29.3
Full HD	1920	1080	2.074	98.9 / 95.8	98.9 / 80.0	85.3 / 43.0
UXGA	1600	1200	1.920	90.2 / 90.2	90.2 / 87.5	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 / 108.5
SVGA	800	600	0.480	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	421.4 / 421.4		
QQVGA	160	120	0.019	490.0 / 490.0		
Max. × half	4512	2256	10.179	41.1 / 20.8	34.4 / 17.4	18.5 / 9.2
Max. × min.	4512	8	0.036	601.6 / 340.9	521.2 / 290.4	307.6 / 162.9
Min. × max.	8	4512	0.036	26.0 / 26.0		
Min. × min.	8	8	64 P	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 62: 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; 15.86 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	Mono8, Mono10, Mono10p
YUV color pixel formats	Not applicable	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	Not applicable	BayerRG8, BayerRG10, BayerRG10p, BGR8, RGB8 (default)
Maximum frame rate	21 fps[1] (at 450 MBps)	
Exposure time	17 µs to 10 s (450 MBps)	
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 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 3.4 W	

[1] In triggered mode: 10 fps

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

Table 63: Alvium 1800 U-2050m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-2050m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[2]**	**Mainboard[3]**
	Bare board[4]	Not applicable	-20 °C to +85 °C	+5 °C to +88 °C
	Open housing[5]	-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 V2.0 (GenICam Access)			

[2] See Mounting the heat sink on page 199.

[3] Output by `DeviceTemperature`

[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.

[5] Temperature values must be observed for the housing **and** for the cooling areas.

Table 63: Alvium 1800 U-2050m/c specifications (sheet 2 of 2)

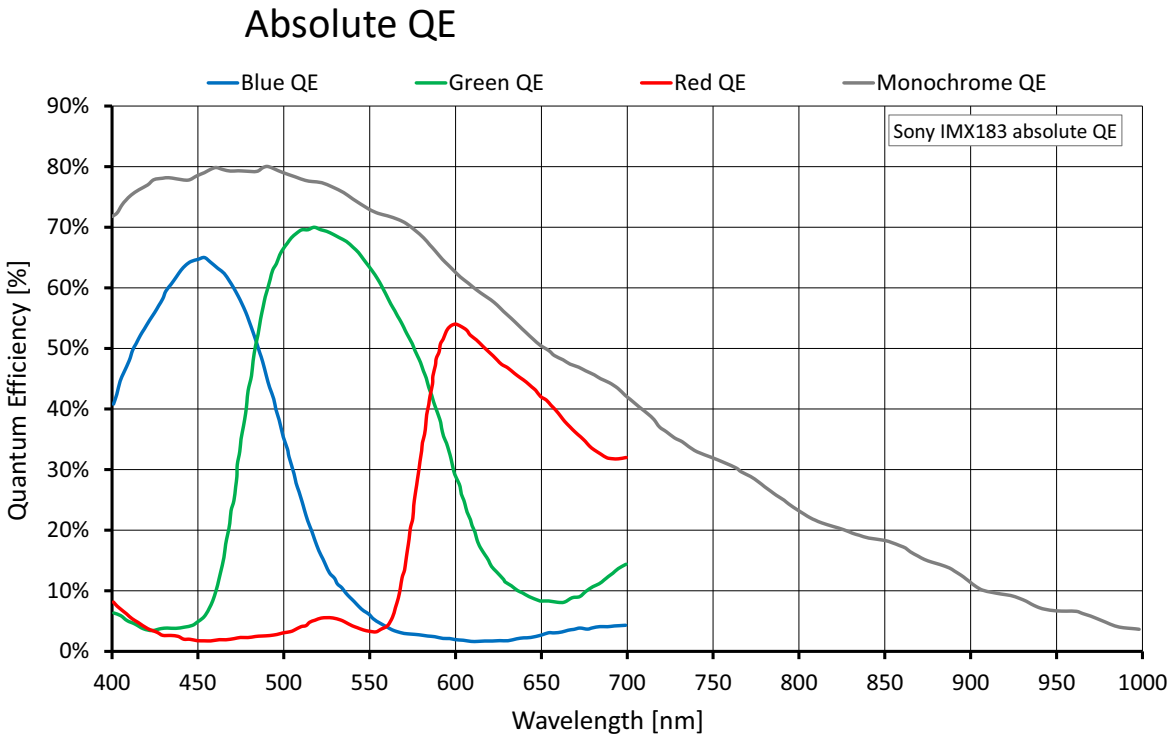


Figure 44: Alvium 1800 U-2050m/c (Sony IMX183) absolute QE

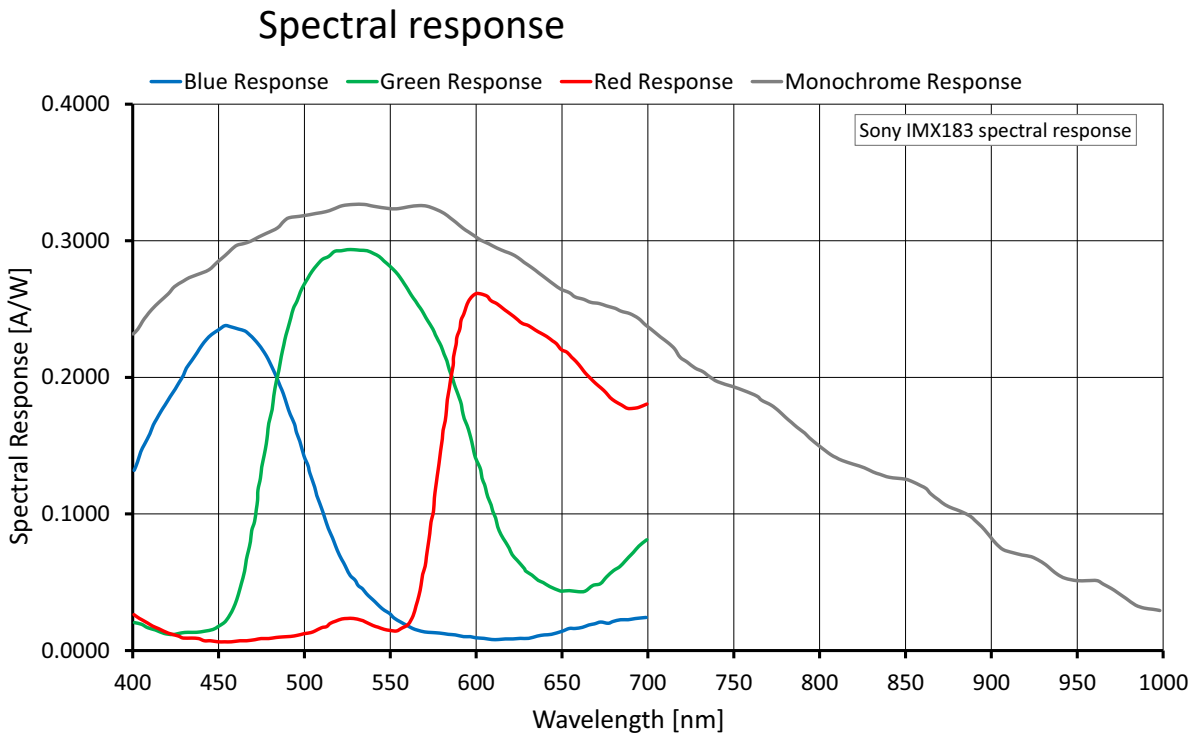


Figure 45: Alvium 1800 U-2050m/c (Sony IMX183) spectral response

ROI frame rates

Values were calculated for rolling shutter (RS) mode as defined in Specified values on page 54. To reach the maximum frame rate available for this setup, the bandwidth for image traffic is 450 MBps.

In GRS mode, the values for maximum frame rate reached in RS mode apply to all resolutions. **In triggered mode**, the values for maximum frame rate reached in free run mode are cut in half.

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	5496	3672	20.181	21.6 / 10.9	18.0 / 9.0	9.6 / 4.8
HXGA	4096	3072	12.583	25.7 / 12.9	21.4 / 10.8	11.5 / 5.0
UHD 4K	3840	2160	8.294	36.0 / 18.2	30.0 / 15.2	16.2 / 8.0
QSXGA	2560	2048	5.243	37.8 / 19.1	31.5 / 15.9	17.0 / 8.0
WQHD	2560	1440	3.686	41.7 / 21.1	34.8 / 17.6	18.8 / 9.0
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	5496	1836	10.091			
Max. × min.	5496	8	0.044			
Min. × max.	8	3672	0.029	21.6 / 10.9	18.0 / 9.0	9.6 / 4.8
Min. × min.	8	8	64 P	41.7 / 21.1	34.8 / 17.6	18.8 / 9.0

[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 64: 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; 14.60 mm × 12.63 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	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p, BGR8, RGB8 (default)
Maximum frame rate	17 fps (at 450 MBps)	
Exposure time	31 µs to 10 s (450 MBps)	
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	
Image buffer (RAM)	256 KB	
Non-volatile memory (Flash)	1024 KB	
GPIOs	4 programmable GPIOs As direct inputs (push-pull): 0 to 5.5 VDC 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 External power: 4.2 W	

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

Table 65: Alvium 1800 U-2460m/c specifications (sheet 1 of 2)

Feature	Specification			
	1800 U-2460m/c			
Storage temperature	-20 °C to +85 °C ambient temperature			
Operating temperature	**Hardware option**	**Housing**	**Cooling areas[2]**	**Mainboard[3]**
	Bare board[4]	Not applicable	-20 °C to +85 °C	-20 °C to +85 °C
	Open housing[5]	-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 V2.0 (GenICam Access)			

[2] See Mounting the heat sink on page 199.

[3] Output by `DeviceTemperature`

[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.

[5] Temperature values must be observed for the housing **and** for the cooling areas.

Table 65: Alvium 1800 U-2460m/c specifications (sheet 2 of 2)

Absolute QE

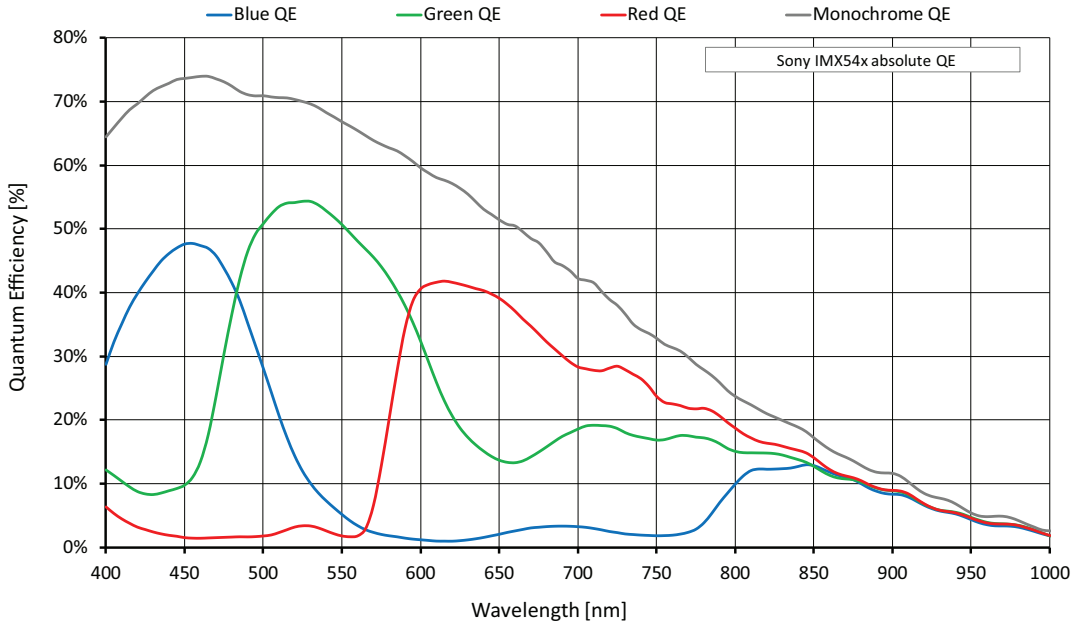


Figure 46: Alvium 1800 U-2460m/c (Sony IMX540) absolute QE

Spectral response

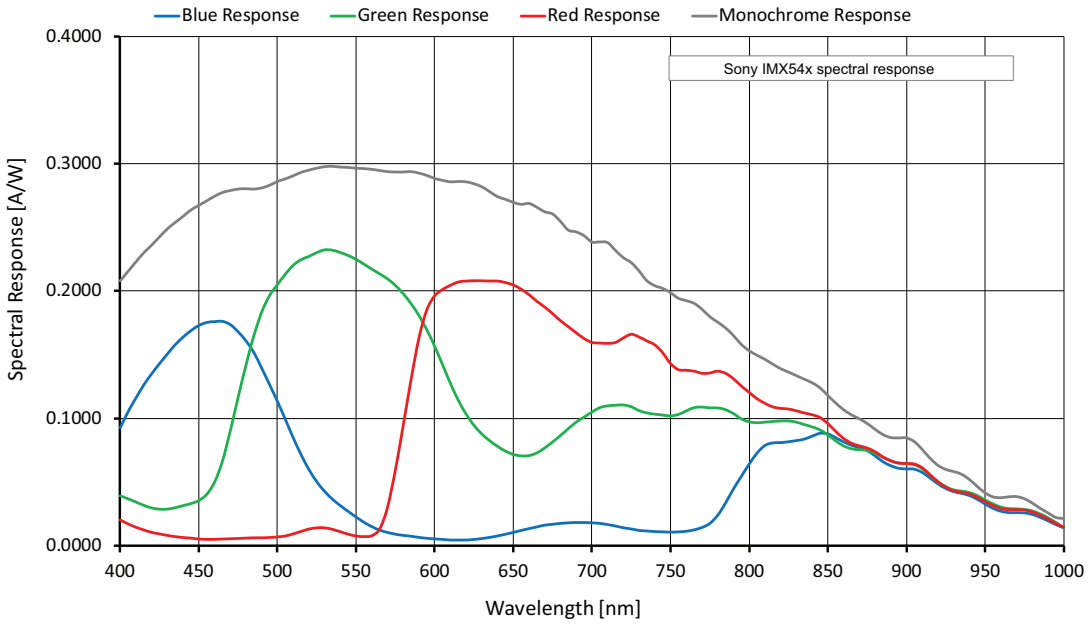


Figure 47: Alvium 1800 U-2460m/c (Sony IMX540) spectral response

ROI frame rates

Values were calculated as defined in Specified values on page 54.

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

Image format	Width [pixels]	Height [pixels]	ROI area [MP]	Frame rate [fps][1]		
				450 MBps	375 MBps	200 MBps
Full resolution	5328	4608	24.551	17.7 / 8.8	14.8 / 7.4	7.9 / 3.9
HSXGA	5120	4096	20.972	20.6 / 10.4	17.2 / 8.6	9.2 / 4.6
HXGA	4096	3072	12.583	32.0 / 17.1	28.4 / 14.3	15.2 / 7.6
UHD 4K	3840	2160	8.294	44.6 / 25.5	42.1 / 21.2	22.7 / 11.4
QSXGA	2560	2048	5.243	47.1 / 40.1	47.1 / 33.5	35.7 / 17.9
WQHD	2560	1440	3.686	65.3 / 55.6	65.3 / 46.5	49.5 / 24.9
QXGA	2048	1536	3.146	61.7 / 61.7	61.7 / 54.8	58.2 / 29.3
Full HD	1920	1080	2.074	85.0 / 85.0	85.0 / 80.1	85.0 / 43.1
UXGA	1600	1200	1.920	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	115.3 / 115.3		115.3 / 108.7
SVGA	800	600	0.480	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	2304	12.276	34.3 / 17.3	28.7 / 14.4	15.4 / 7.7
Max. × min.	5328	8	0.043	517.6 / 293.0	447.9 / 249.3	264.1 / 139.9
Min. × max.	8	4608	0.037	21.8 / 21.8		
Min. × min.	8	8	64 P	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 66: 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 67 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.

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-158c	Sony IMX273	2.355	2.100
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-508c	Sony IMX250	2.355	2.100
1800 U-511c	Sony IMX547	2.870	2.000
1800 U-811c	Sony IMX546	2.870	2.000
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 67: Alvium default values for color channels

Monochrome and VSWIR models

White balance default does not apply to monochrome and VSWIR models.

Dimensions and mass

Bare board

Feature	Standard	USB 90°
Dimensions (L × W × H [mm])	[Model specific] × 26 × 26	[Model specific] × 30 × 26
Mass	15 g	15 g

Table 68: Bare board dimensions and mass

Open housing

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

Table 69: Open housing dimensions and mass

Open housing 90°

USB 90° open housing	S-Mount	CS-Mount	C-Mount
Flange focal distance, optical [mm]	12.63	12.526	17.526
Thread [mm]	M12 × 0.5	1x32TPI-UNS-2B	1x32TPI-UNS-2B
Maximum protrusion[1] [mm]	11.0	8.6	13.6
Body dimensions (L × W × H [mm])	25 × 32 × 29	25 × 32 × 29	30 × 32 × 29
Mass	50 g	50 g	50 g
[1] For details, see Lens mounts and maximum protrusion.			

Table 70: Open housing 90° dimensions and mass

Closed housing

Closed housing	S-Mount	CS-Mount	C-Mount
Flange focal distance, optical [mm]	12.63	12.526	17.526
Thread [mm]	M12 × 0.5	1x32TPI-UNS-2B	1x32TPI-UNS-2B
Maximum protrusion[1] [mm]	11.0	8.6	13.6
Body dimensions (L × W × H [mm])	33 × 29 × 29	33 × 29 × 29	38 × 29 × 29
Mass[2]	60 g	60 g	60 g
Mass[3]	65 g	65 g	65 g

[1] For details, see Lens mounts and maximum protrusion.

[2] Alvium 1800 U-040,-050,-120,-234,-235,-319,-500,-501,-507

[3] Alvium 1800 U-030,-052,-130,-158,-240,-291,-508,-511,-811, 812,-1236,-1240,-1242,-1620, -2040,-2050,-2460

Table 71: Closed housing dimensions and mass

Closed housing 90°

USB 90° Closed housing	S-Mount	CS-Mount	C-Mount
Flange focal distance, optical [mm]	12.63	12.526	17.526
Thread [mm]	M12 × 0.5	1x32TPI-UNS-2B	1x32TPI-UNS-2B
Maximum protrusion[1] [mm]	11.0	8.6	13.6
Body dimensions (L × W × H [mm])	33 × 32 × 29	33 × 32 × 29	38 × 32 × 29
Mass[2]	65 g	65 g	65 g
Mass[3]	70 g	70 g	70 g

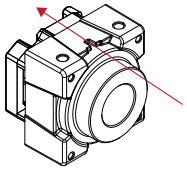
[1] For details, see Lens mounts and maximum protrusion.

[2] Alvium 1800 U-040,-050,-120,-234,-235,-319,-500,-501,-507

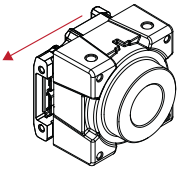
[3] Alvium 1800 U-030,-052,-130,-158,-240,-291,-508,-511,-811, 812,-1236,-1240,-1242,-1620, -2040,-2050,-2460

Table 72: Closed housing 90° dimensions and mass

Technical drawings



Standard

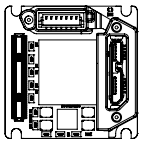
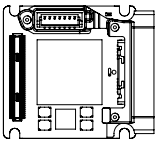


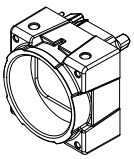
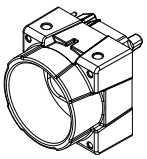
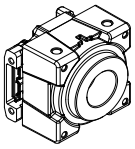
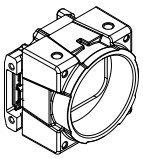
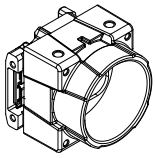
90°

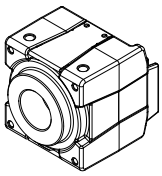
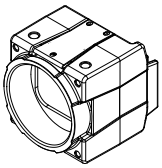
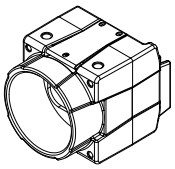
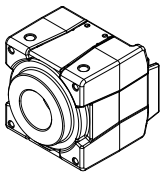
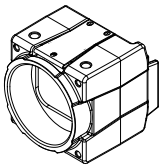
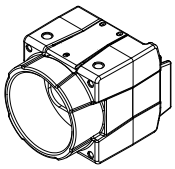
USB connector position

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

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

Bare Board	
Standard	**90°**
	
page 161	page 162

Open Housing					
Standard			**90°**		
S-Mount	CS-Mount	C-Mount	S-Mount	CS-Mount	C-Mount
					
page 164	page 165	page 166	page 167	page 168	page 169

Closed Housing					
Standard			**90°**		
S-Mount	CS-Mount	C-Mount	S-Mount	CS-Mount	C-Mount
					
page 170	page 171	page 172	page 173	page 174	page 175

Bare Board

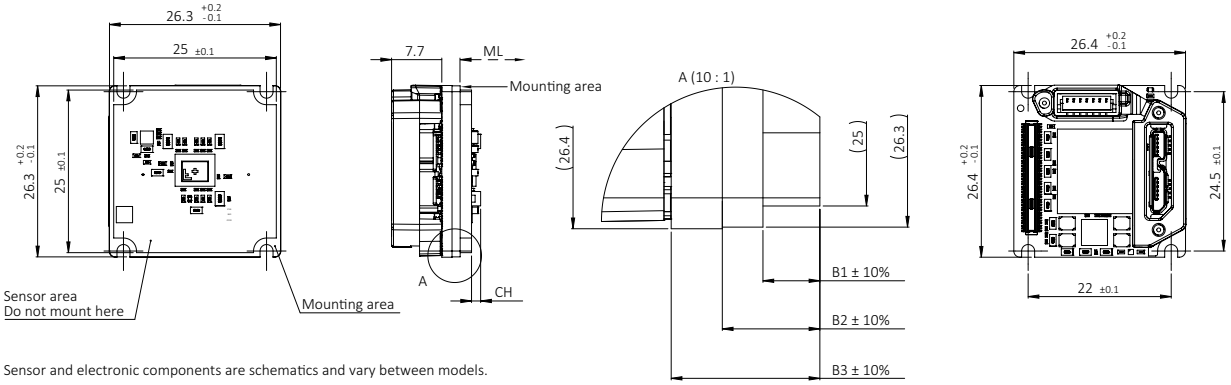


Figure 48: Bare Board dimensions

Dimensions that are common between different models are shown in Figure 48, model specific dimensions are listed in Table 73. **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 S-Mount and CS-Mount

Mechanical length for other mounts is:

- CS-Mount: [C-Mount value] – 5 mm
- S-Mount: depending on your design.

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	19.897 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	3.77 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-158m/c	19.897 mm	2.27 mm	1.20 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	3.77 mm
Alvium 1800 U-319m/c	19.929 mm	2.27 mm	1.25 mm	2.20 mm	3.75 mm
* Theoretical values					

Table 73: Bare Board model specific dimensions and nominal values (sheet 1 of 2)

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-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-508m/c	19.929 mm	2.27 mm	1.25 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-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-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 73: Bare Board model specific dimensions and nominal values (sheet 2 of 2)

Bare Board 90°

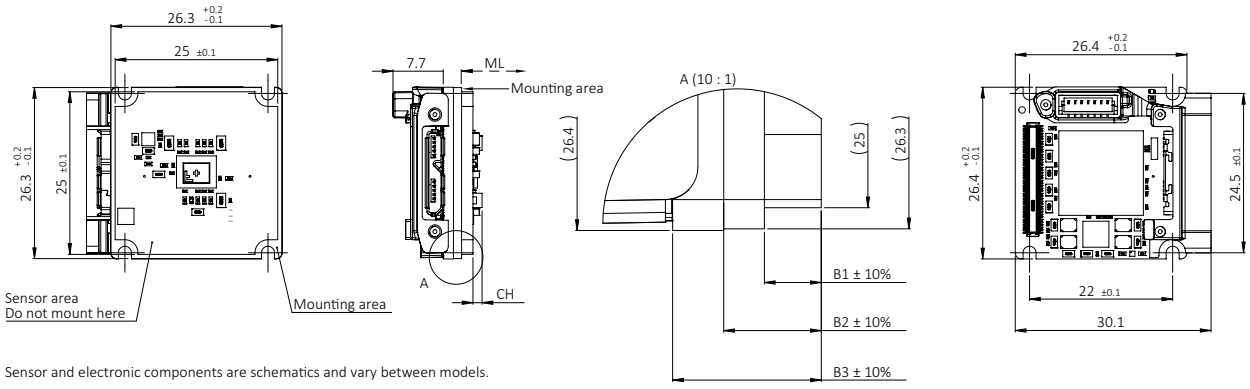


Figure 49: Bare Board 90° dimensions

Dimensions that are common between different models are shown in Figure 49, model specific dimensions are listed in Table 74. **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 S-Mount and CS-Mount

Mechanical length for other mounts is:

- CS-Mount: [C-Mount value] – 5 mm
- S-Mount: depending on your design.

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	19.897 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	3.77 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-158m/c	19.897 mm	2.27 mm	1.20 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	3.77 mm
Alvium 1800 U-319m/c	19.929 mm	2.27 mm	1.25 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-508m/c	19.929 mm	2.27 mm	1.25 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-811m/c	19.613 mm	2.88 mm	1.00 mm	2.20 mm	3.75 mm
Alvium 1800 U-812 UV	xx mm	xx mm	xx mm	xx mm	xx 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 74: Bare Board 90° model specific dimensions and nominal values

Open Housing S-Mount

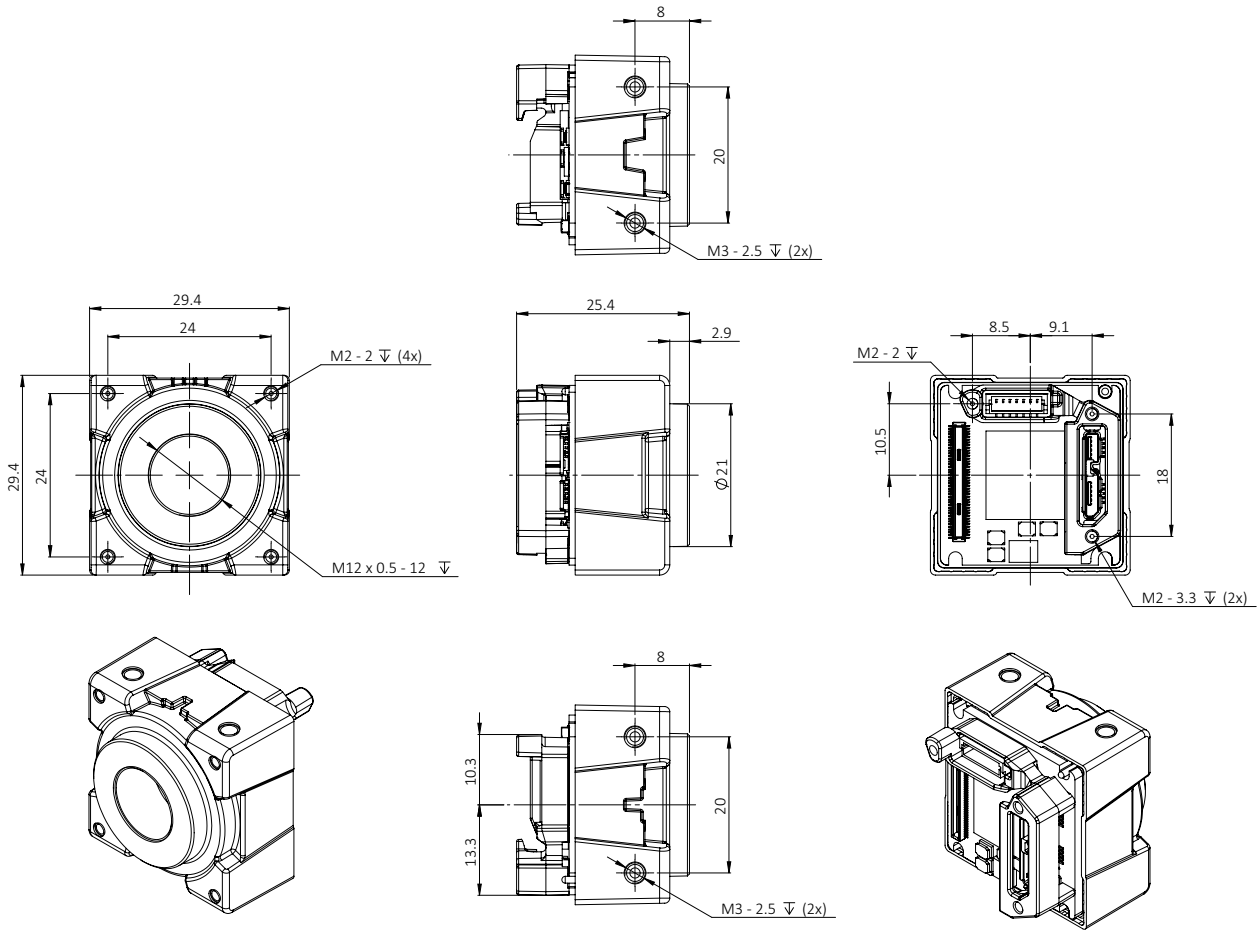


Figure 50: Open Housing S-Mount dimensions

Open Housing CS-Mount

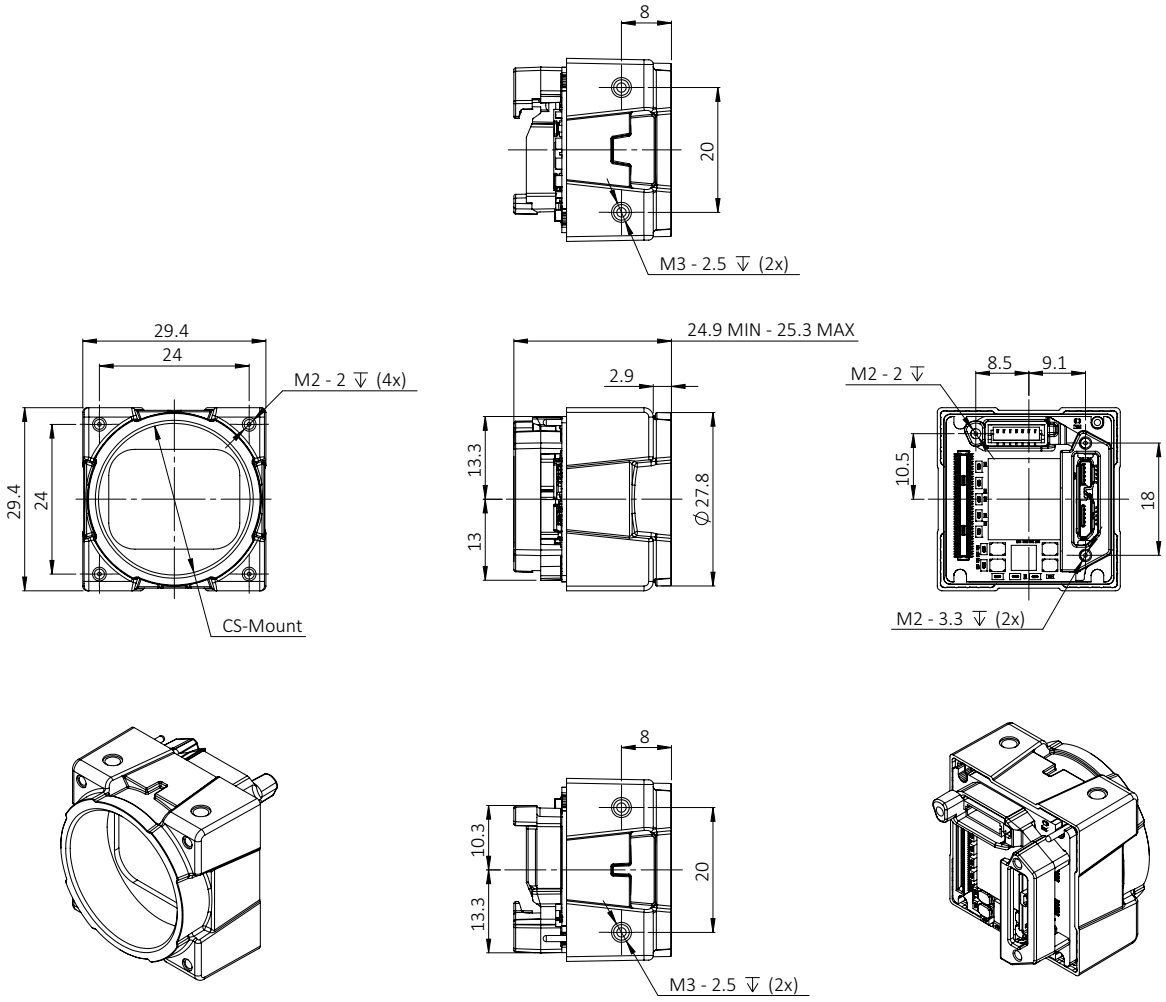


Figure 51: Open Housing CS-Mount dimensions

Open Housing C-Mount

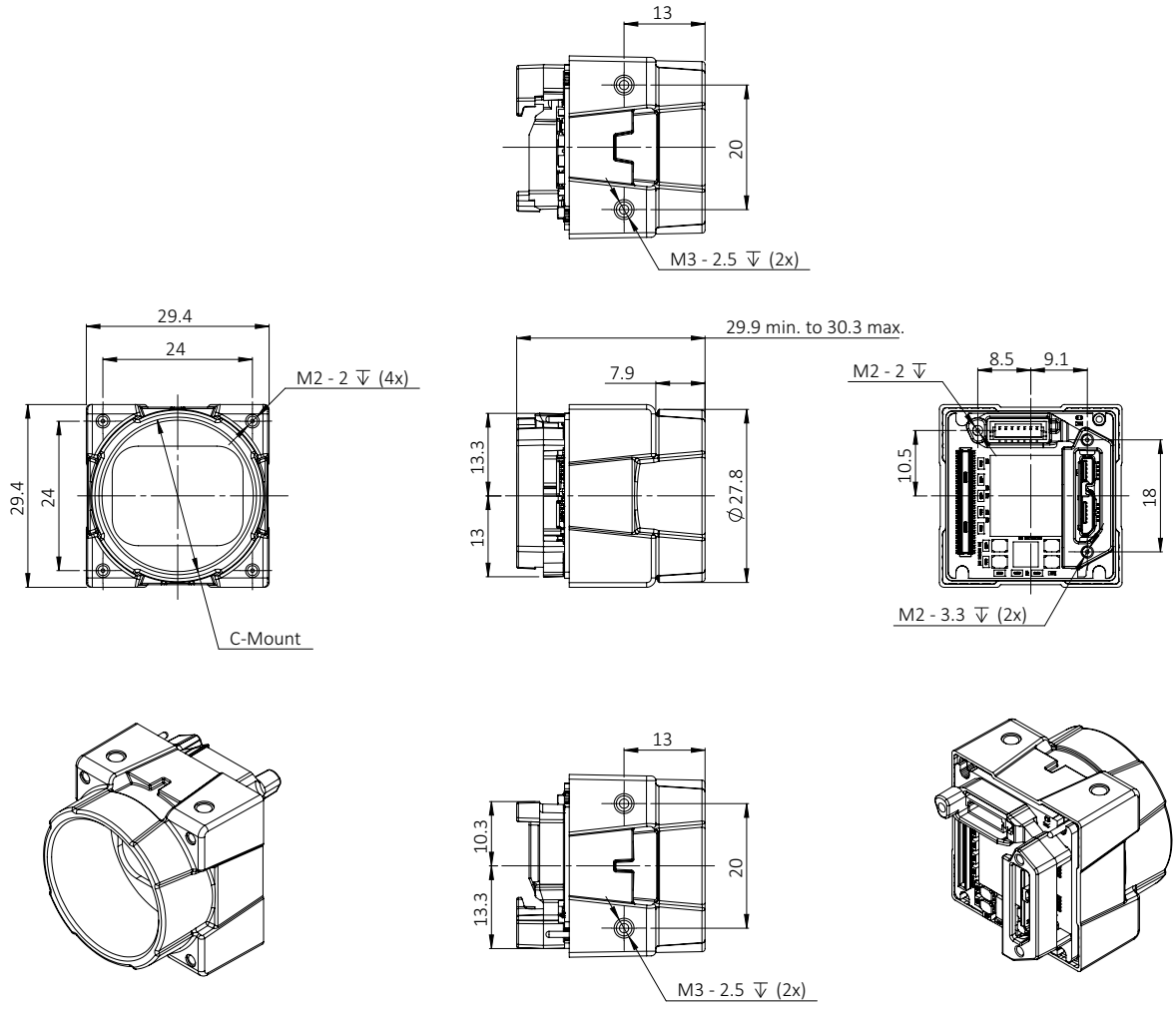


Figure 52: Open Housing C-Mount dimensions

Open Housing S-Mount 90°

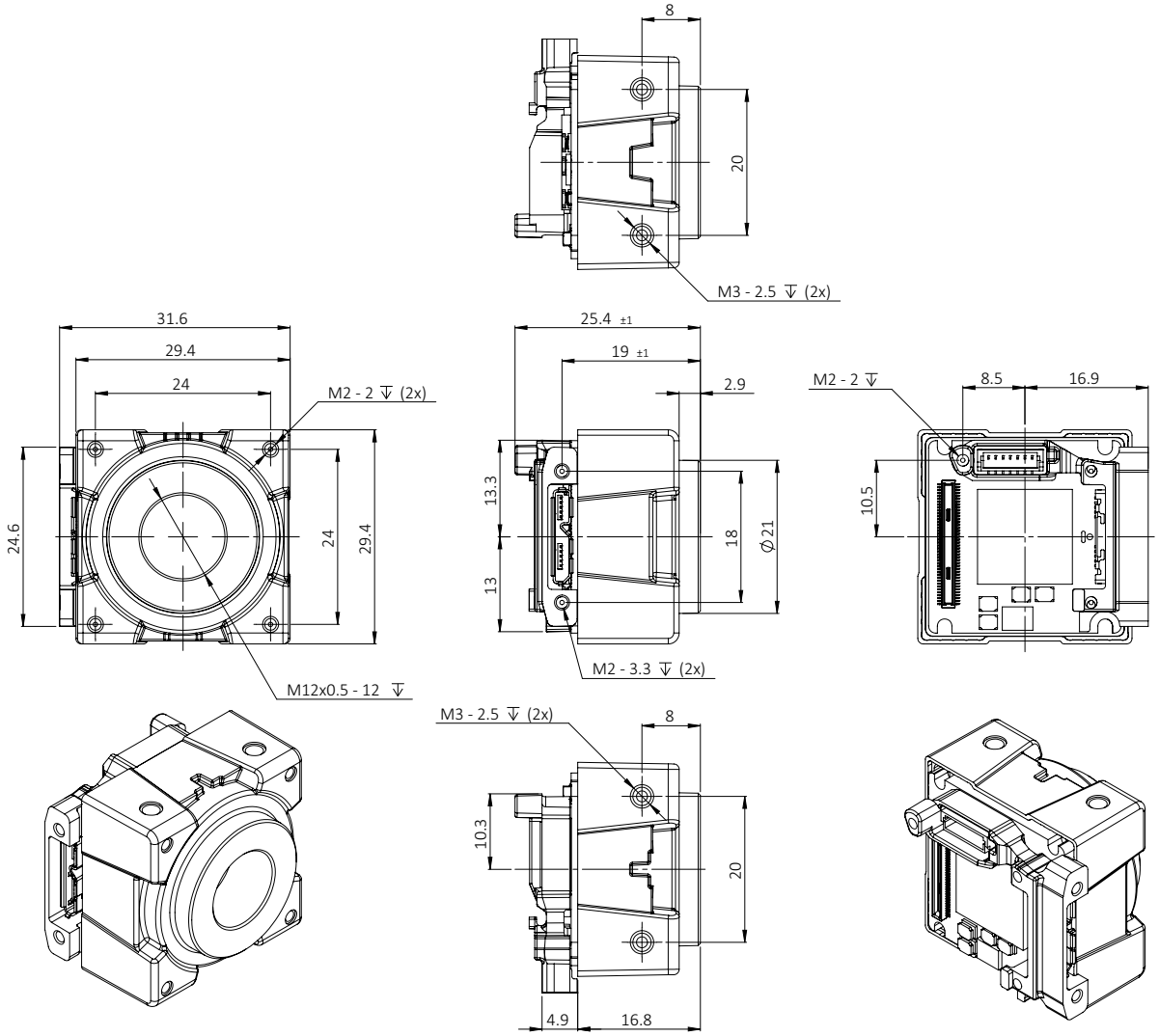


Figure 53: Open Housing S-Mount 90° dimensions

Open Housing CS-Mount 90°

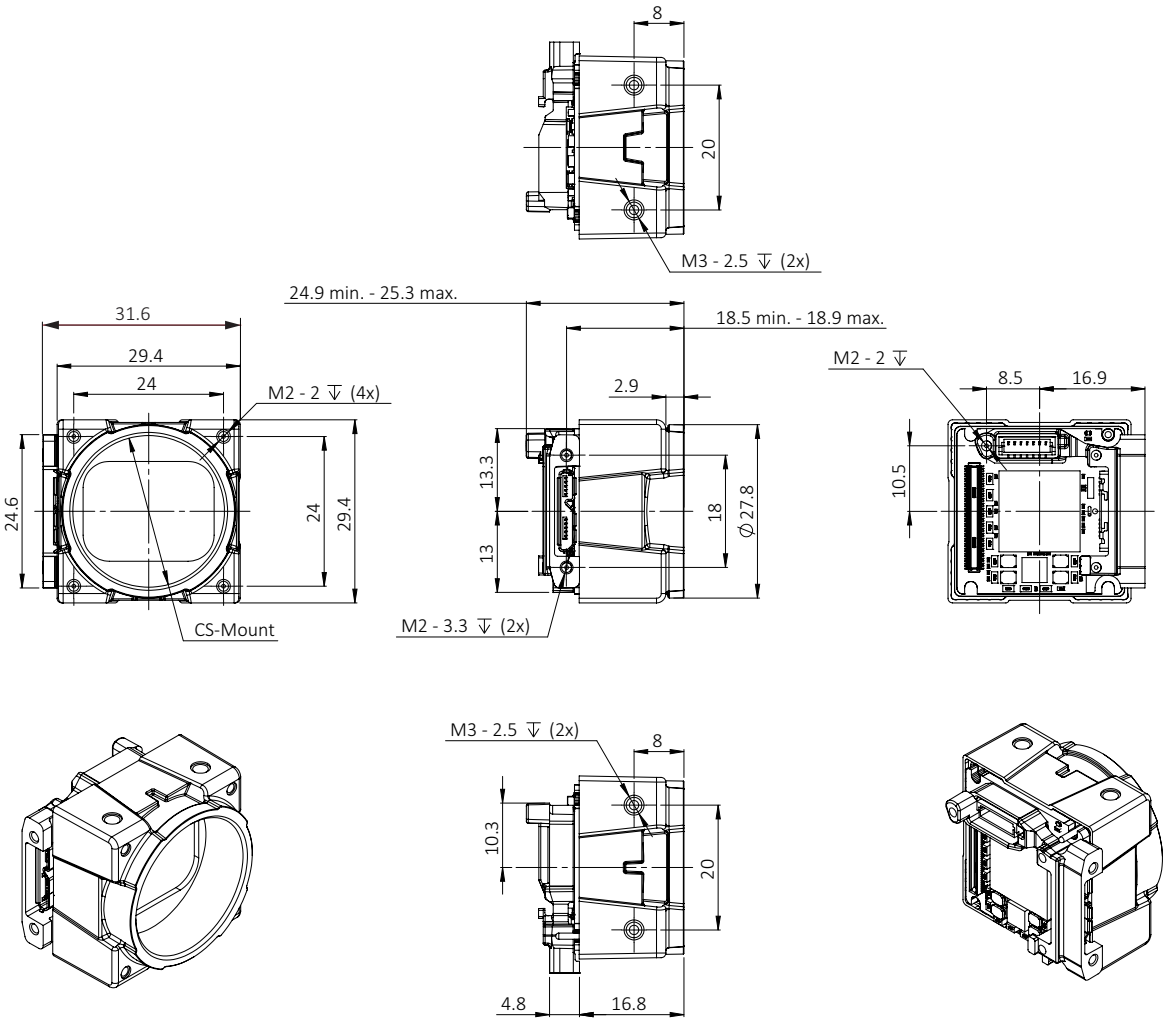


Figure 54: Open Housing CS-Mount 90° dimensions

Open Housing C-Mount 90°

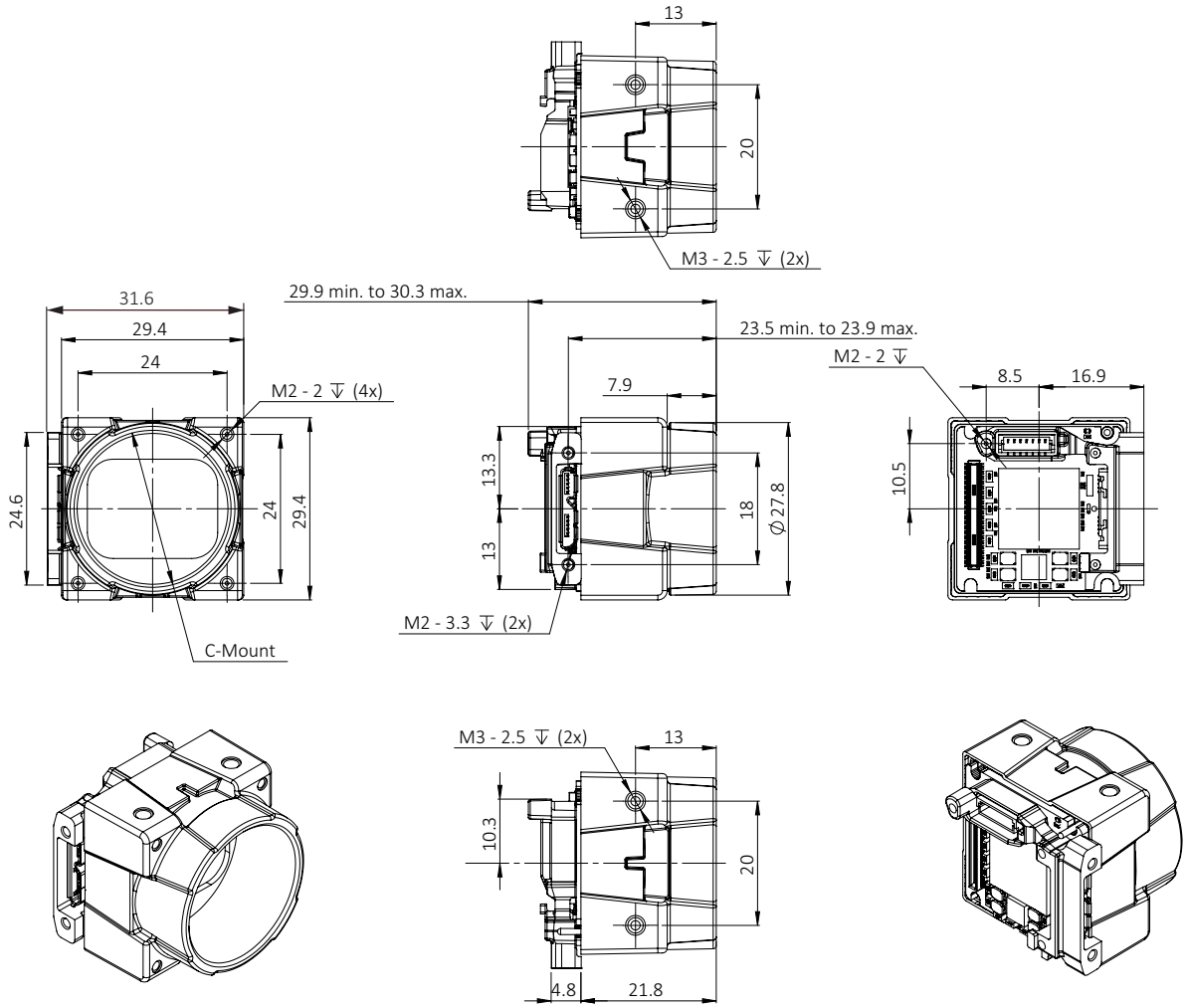


Figure 55: Open Housing C-Mount 90° dimensions

Closed Housing S-Mount

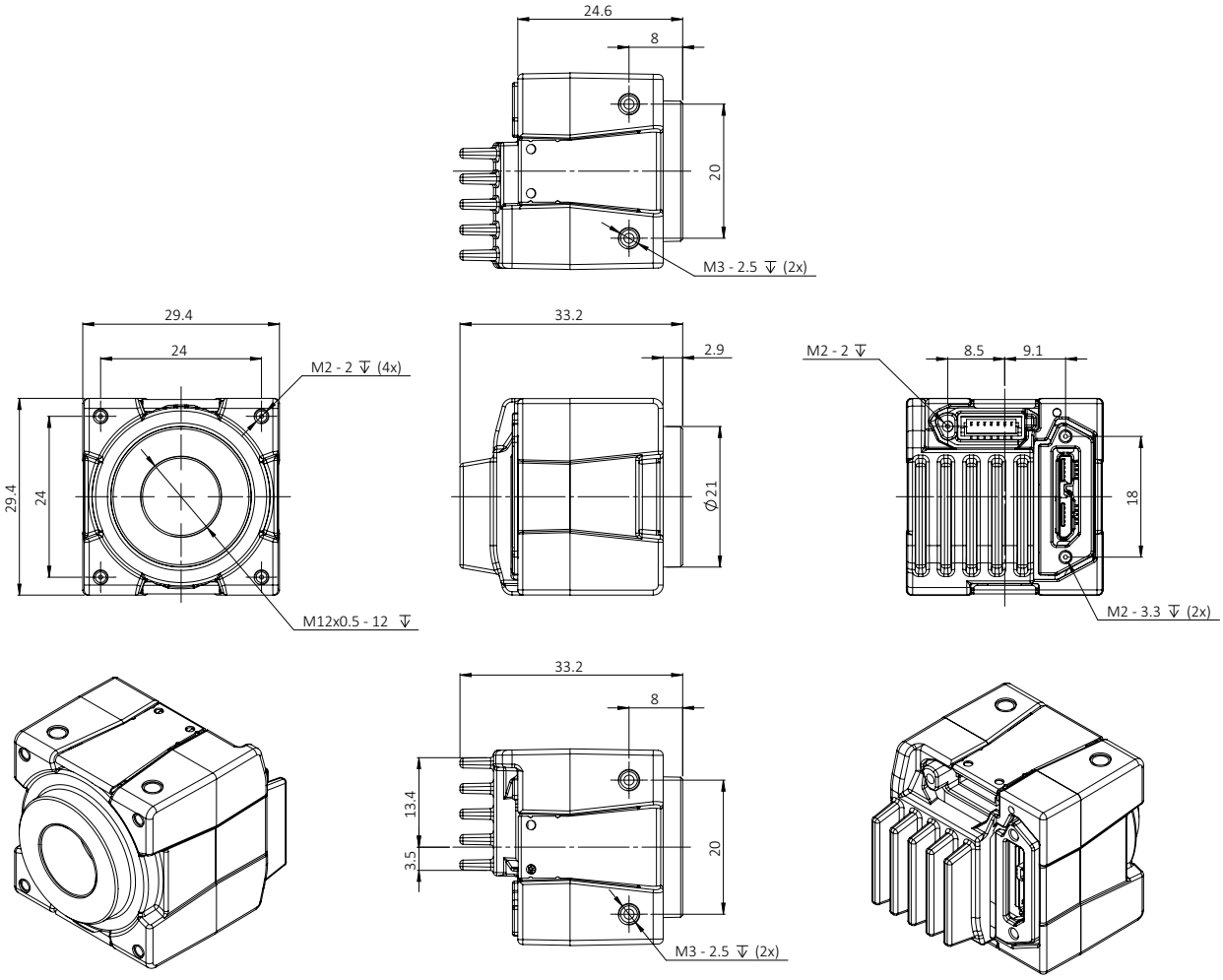


Figure 56: Closed Housing S-Mount dimensions

Closed Housing CS-Mount

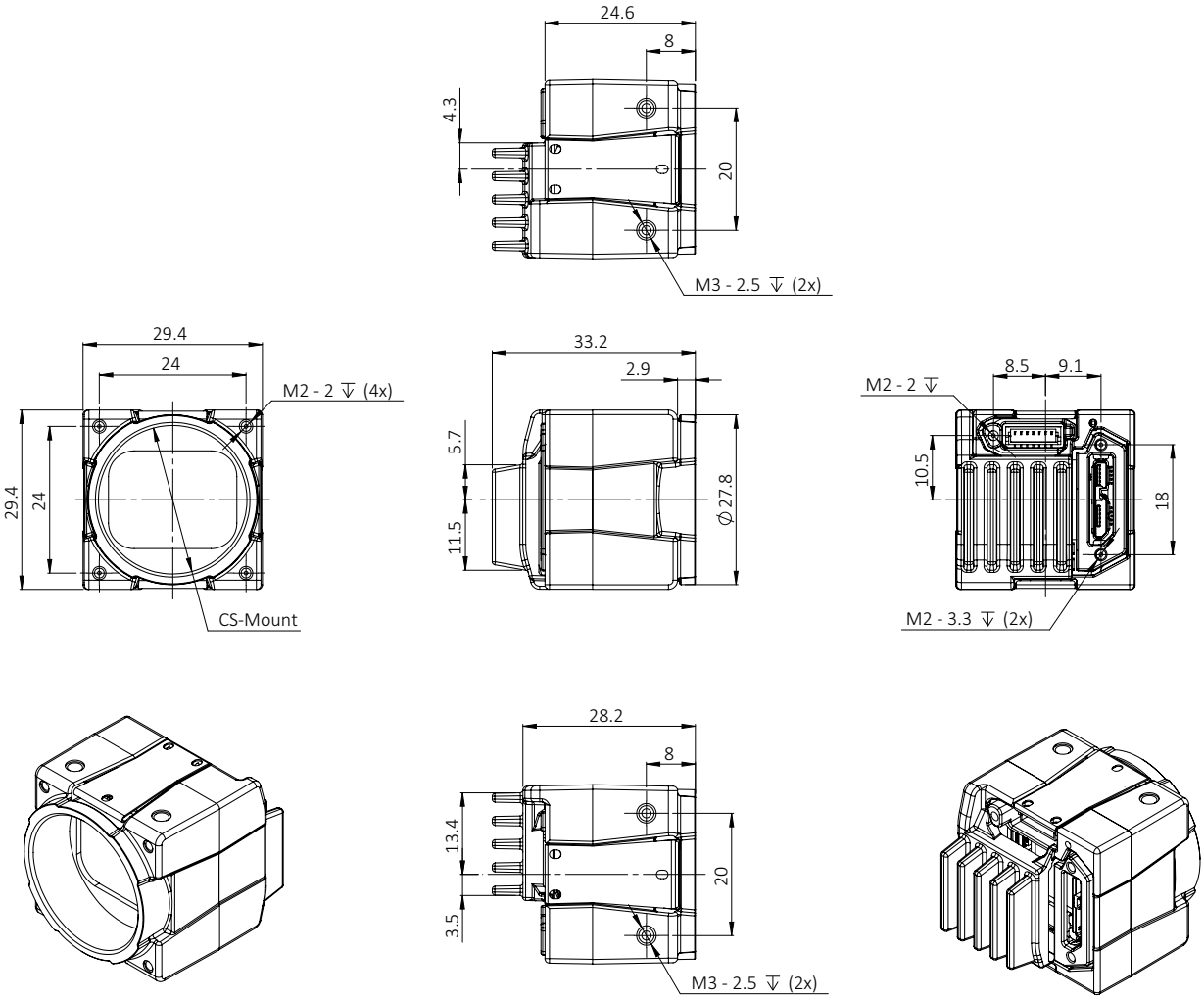


Figure 57: Closed Housing CS-Mount dimensions

Closed Housing C-Mount

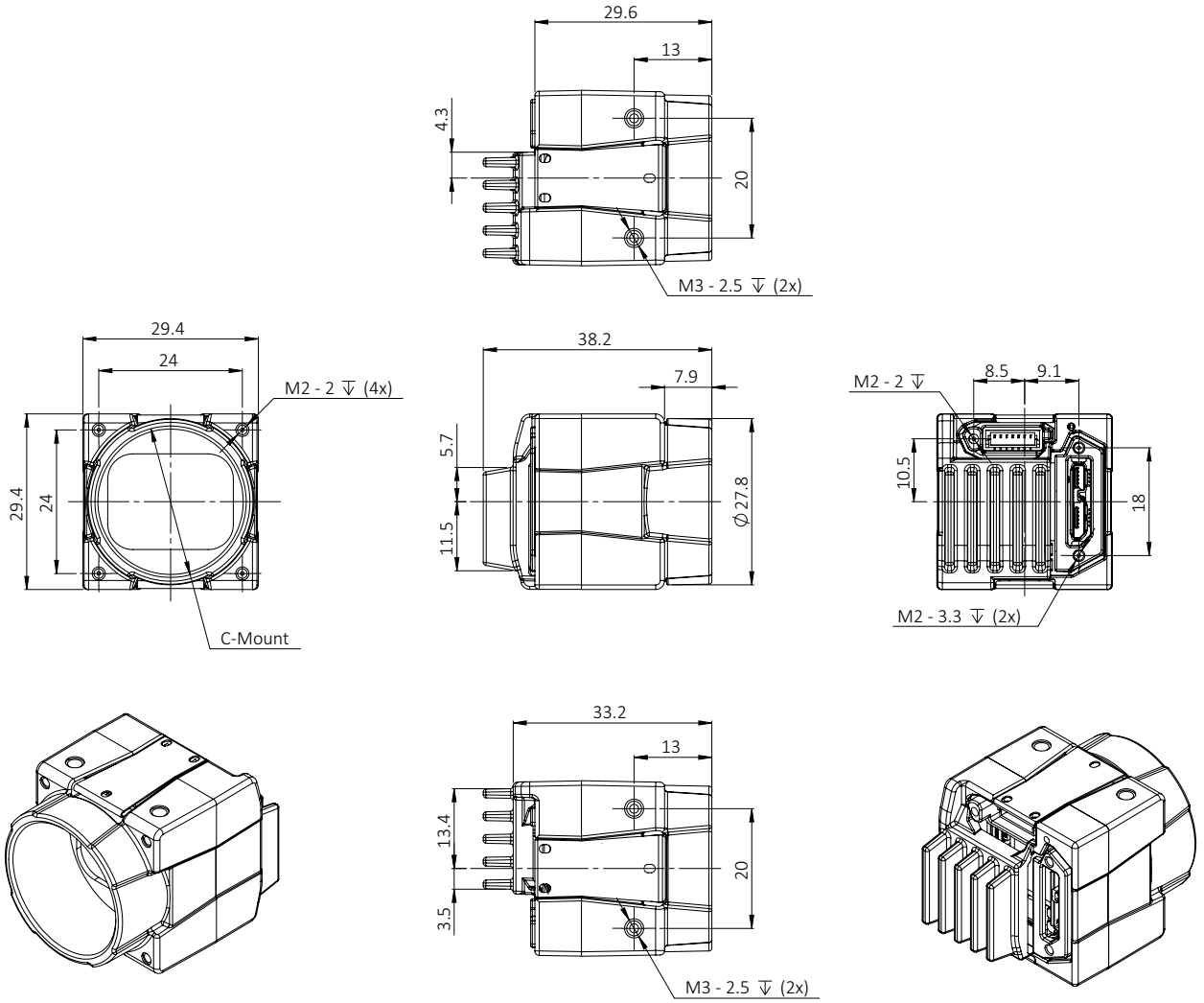


Figure 58: Closed Housing C-Mount dimensions

Closed Housing S-Mount 90°

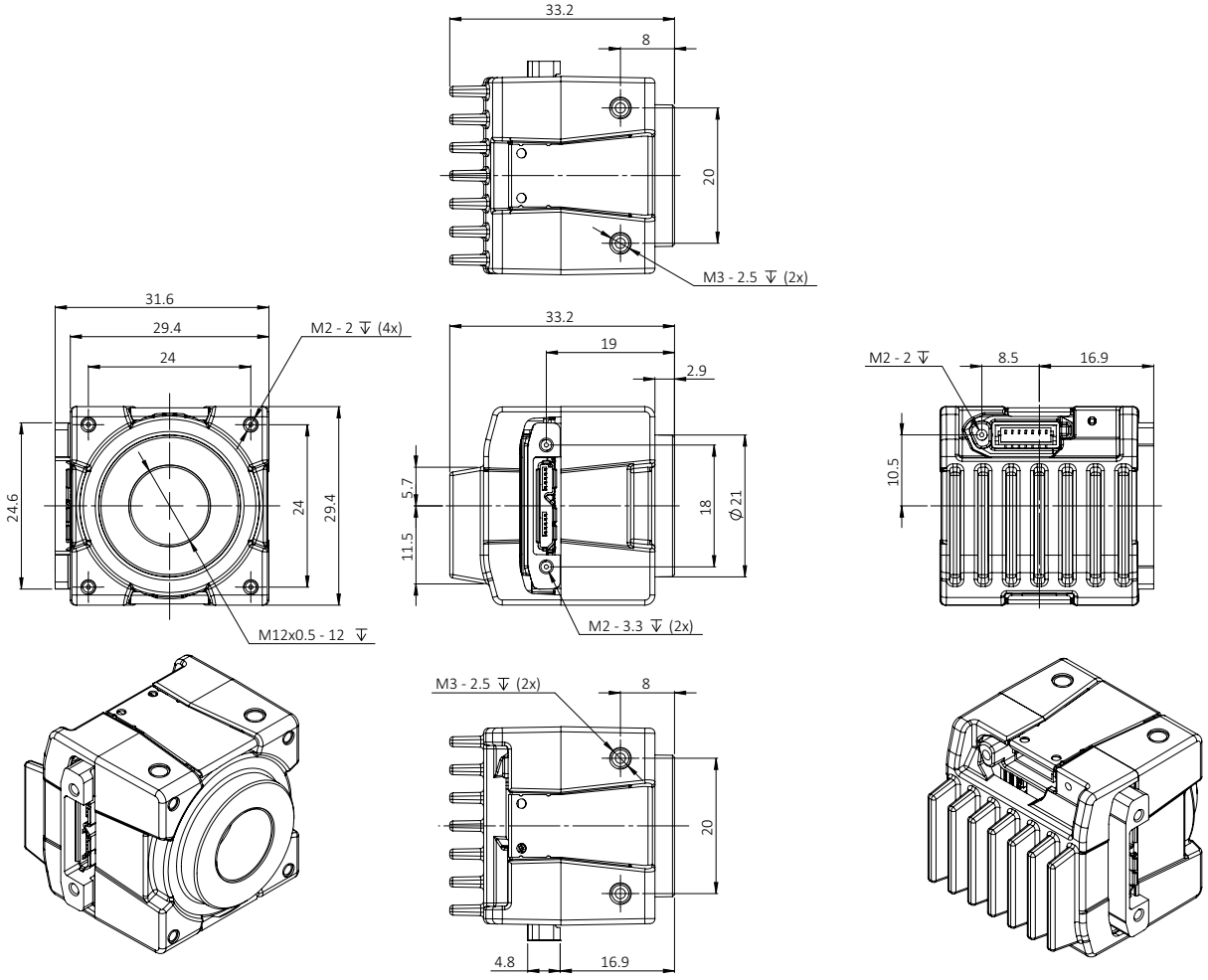


Figure 59: Closed Housing S-Mount 90° dimensions

Closed Housing CS-Mount 90°

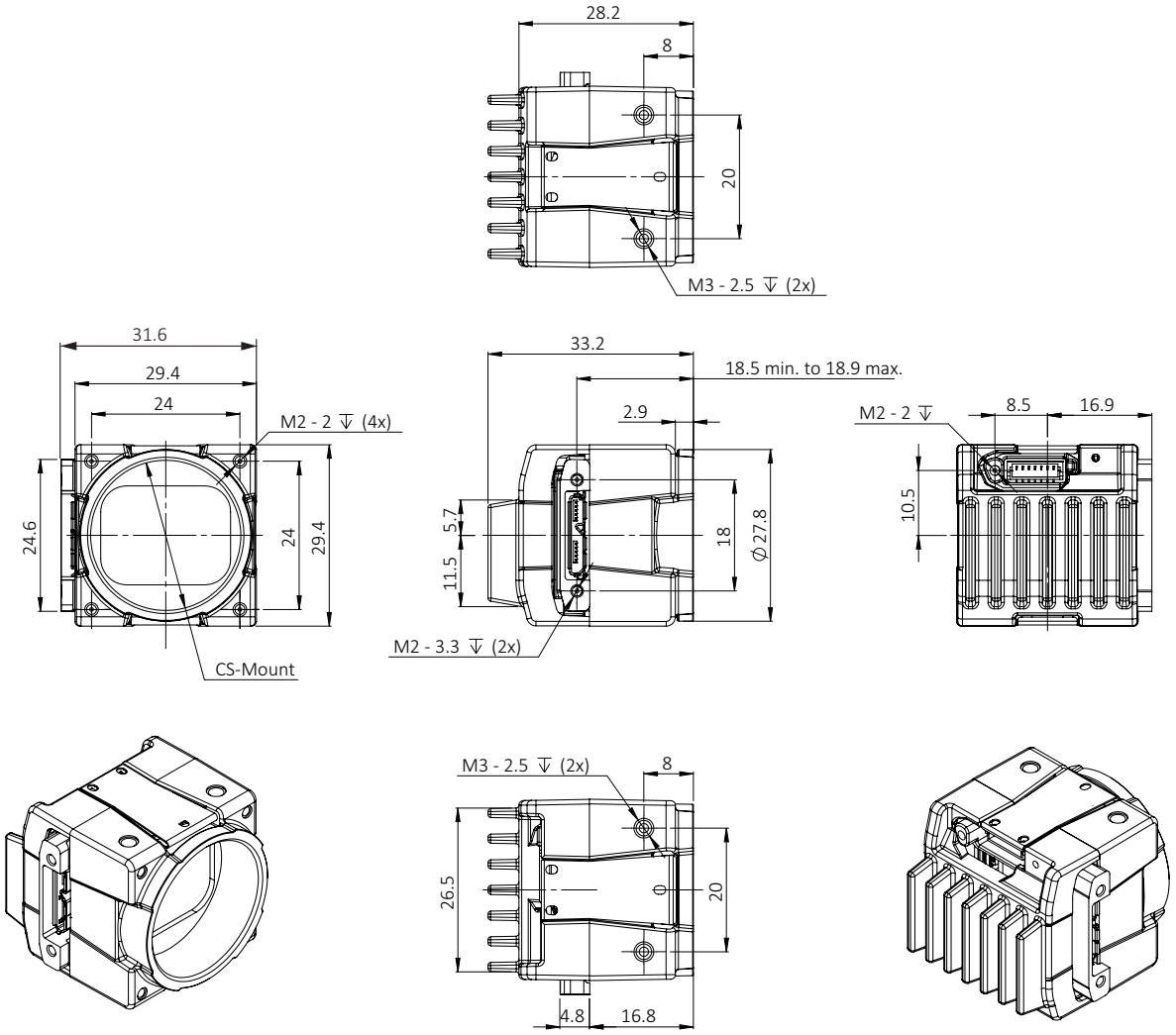


Figure 60: Closed Housing CS-Mount 90° dimensions

Closed Housing C-Mount 90°

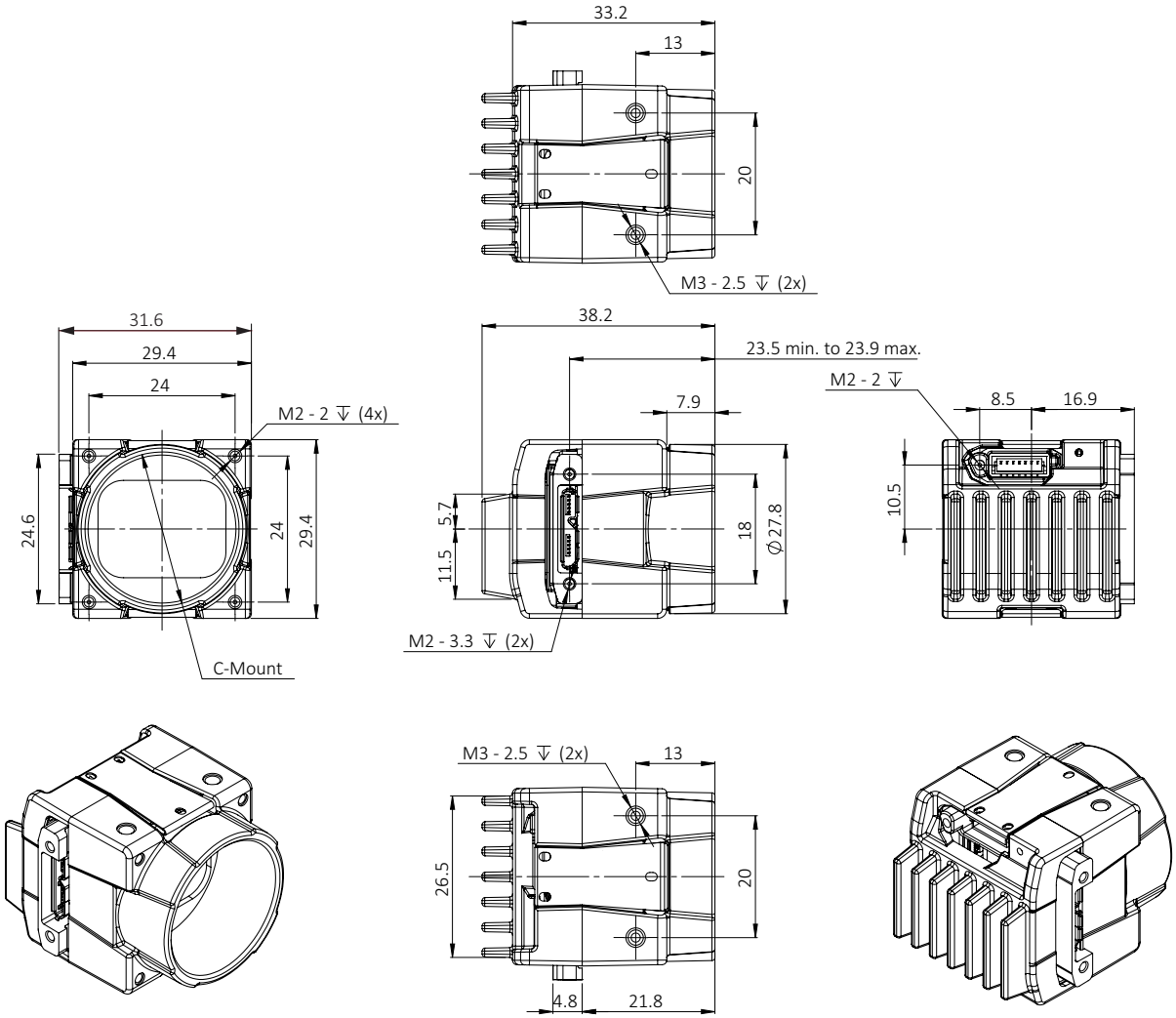
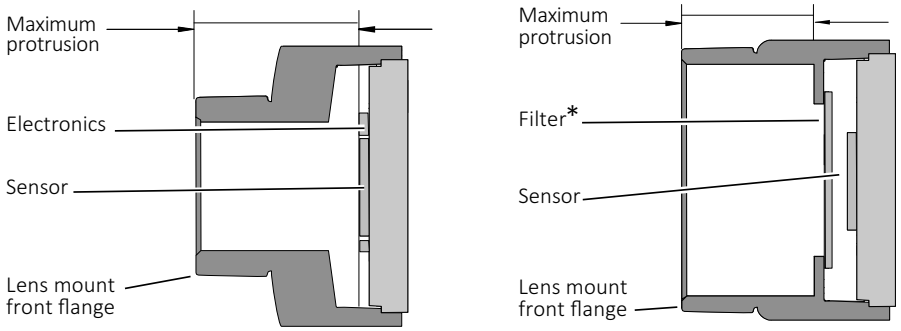


Figure 61: Closed Housing C-Mount 90° dimensions

Lens mounts and maximum protrusion

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.



*Only color models are equipped with an IR cut filter

Figure 62: Maximum protrusion S-Mount (left); CS-Mount and C-Mount (right)

Figure 62 shows schematics for maximum protrusion of lenses, Table 75 shows values for maximum protrusion.

NOTICE

Damage to sensor or optics by unsuitable lenses

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

- Use lenses with less than the allowed maximum protrusion, see Table 75.
- See Mounting the lens on page 204.
- For S-Mount lenses, see Mounting and focusing S-Mount lenses on page 205.

Mount	Maximum protrusion
S-Mount	11.0 mm
CS-Mount	8.6 mm
C-Mount	13.6 mm

Table 75: Alvium USB cameras maximum protrusion

IR cut filter

Table 76 shows which Alvium models are equipped with an IR cut filter. The filter is permanently installed and cannot be removed.

Color or monochrome model	Bare board	S-Mount	CS-Mount	C-Mount
Color	No filter		Type Hoya C-5000 IR cut filter	
Monochrome	No filter			

Table 76: 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 63 for filter transmission.

Spectral transmission values

The following curve shows typical transmission for type Hoya C-5000 IR cut filter. Values may vary slightly by filter lot.

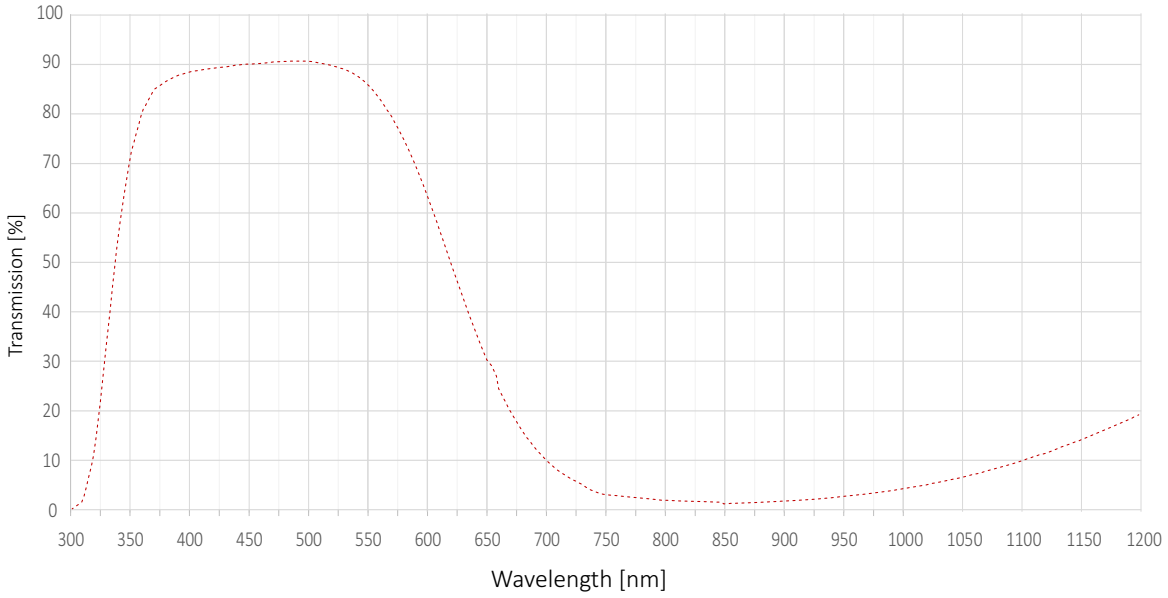


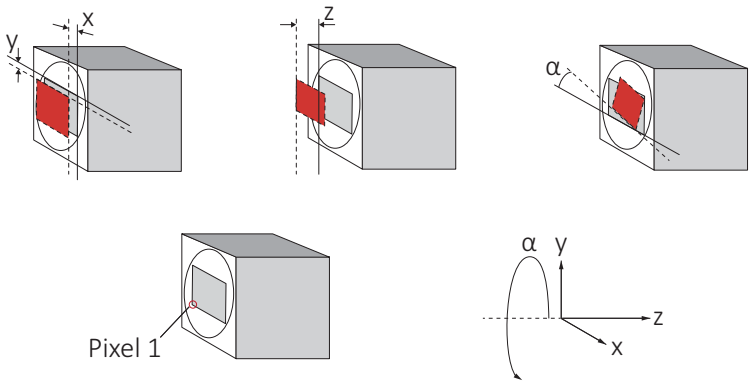
Figure 63: Type Hoya C-5000 IR cut filter spectral transmission (exemplary curve)

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/User_Guide/S-Mount-Lenses_User-Guide.pdf.

Sensor position accuracy

Sensor shift and rotation



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

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

Figure 64: Sensor shift and rotation

The following table defines the manufacturing accuracy for sensor positioning.

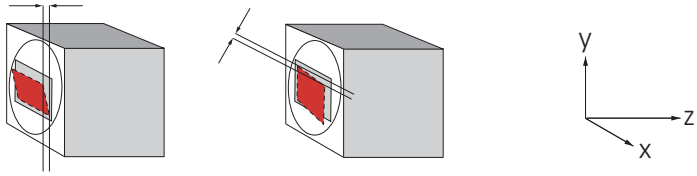
Criteria	Subject	Properties
Alignment method		Optical alignment of the photosensitive sensor area into the camera front module (lens mount front flange)
Reference Points	Sensor	Center of the pixel area (photo sensitive cells)
	Camera	Center of the lens mount
Accuracy	x/y-axis[1,2]	±150 µm (sensor shift)
	z	0 to -100 µm (optical back focal length)
	α[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 **non-standard S-Mount hardware options** that are manufactured on customer request for: Alvium 1800 U-052, U-234, U-235, U-291, U-507, U-508, U-511, U-811, U-812 UV, U-1236, U-1242, U-1620, U-2040, U-2050, and U-2460.

[2] For Alvium 1800 U-2050 models, the complete offset is ±200 µm, common tolerances do not have to be added.

Table 77: Alvium USB cameras, criteria of sensor position accuracy

Sensor tilt



Gray rectangle: Reference sensor position **Red rectangle**: Current position

Figure 65: 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.

Alvium 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
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-158m/c	3.45 µm × 3.45 µm	24 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-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-508m/c	3.45 µm × 3.45 µm	24 µm
Alvium 1800 U-511m/c	2.74 µm × 2.74 µm	18 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-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 78: Sensor tilt

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:

- Selectors
- Command features
- Read-only features
- Features that do not apply to the corresponding interface, such as CSI-2 related features on a USB camera
- Features in the `LUTControl` category.

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 for `UserSetLoad` is executed.
- Column `DeviceReset` displays how user values are affected when the command for `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 79: 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	Exceptions
Adaptive noise filter	✓	✓	N.a.
Auto exposure	✓	✓	N.a.
Auto gain	✓	✓	N.a.
Auto white balance	-	✓	N.a.
Color transformation (including hue, saturation)	-	✓	N.a.
Contrast	✓	✓	N.a.
Custom convolution	✓	✓	N.a.
De-Bayering up to 5×5	-	✓	N.a.
DPC (defect pixel correction)	✓	✓	N.a.
Digital binning	✓	✓	N.a.
FPNC (fixed pattern noise correction)	✓	✓	1800 U-2050m/c
Gamma	✓	✓	N.a.
Look up table (LUT)	✓	✓	N.a.
Reverse X/Y	✓	✓	N.a.
ROI (region of interest)	✓	✓	N.a.
Sharpness/Blur	✓	✓	N.a.

Table 80: Image control features by Alvium 1800 U model

Camera control	Monochrome models	Color models	Supported models
Acquisition frame rate	✓	✓	All
Bandwidth control (`DeviceLinkThroughputLimit`)	✓	✓	All
Counters and timers	✓	✓	All
Image chunk data	✓	✓	All
I/O and trigger control	✓	✓	All
Firmware update in the field	✓	✓	All
Sensor ADC readout modes (`SensorBitDepth`)	✓	✓	1800 U-030 VSWIR, -040, -052, -130 VSWIR, -158, -240, -291, -508
Sequencer*	✓	✓	1800 U-500, -501 NIR, 1240, 2050
Serial I/Os	✓	✓	All
Temperature monitoring (mainboard, companion board, interface board)	✓	✓	All
U3 power saving mode	✓	✓	All
User sets	✓	✓	All
* The features in the `SequencerControl` category are still in the testing phase and not fully validated.			

Table 81: Camera control features by Alvium 1800 U model

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.

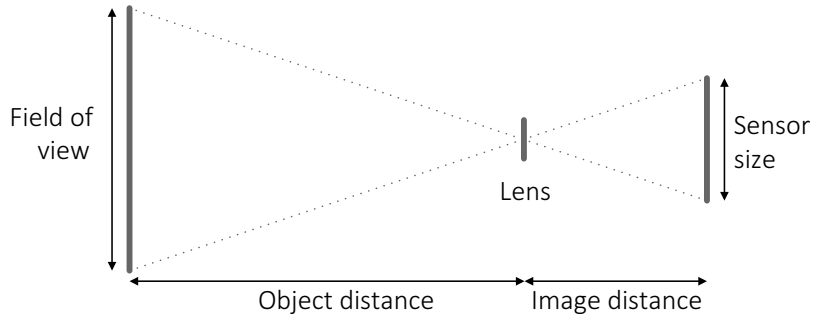


Figure 66: Parameters used in tables for focal length versus FOV

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/User_Guide/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 205 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 82: 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 83: 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 84: 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 85: 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 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 86: 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 87: Focal length versus field of view for Alvium 1800 U-130 VSWIR

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 88: Focal length versus field of view for Alvium 1800 U-158m/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 89: 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 90: 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 91: 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 92: Focal length versus field of view for Alvium 1800 U-319m/c

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 93: Focal length versus field of view for Alvium 1800 U-500m/c and 1800 U-501m/c NIR

Alvium 1800 U-507m/c, 1800 U-508m/c

Values for 1800 U-507m/c and 1800 U-508m/c 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 94: Focal length versus field of view for Alvium 1800 U-507m/c and 1800 U-508m/c

Alvium 1800 U-511m/c

Values for 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 95: Focal length versus field of view for Alvium 1800 U-511m/c

Alvium 1800 U-811m/c, 1800 U-812 UV

Values for 1800 U-811m/c and 1800 U-812 UV cameras Type 2/3 (11 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 96: Focal length versus field of view for Alvium 1800 U-811m/c and 1800 U-812 UV

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 97: 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 98: 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 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 99: 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 100: 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 101: 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 (15.86 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 102: 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 103: 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.

Bare board cameras

If you intend to design an application using bare board cameras, please consider:

- 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. 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.

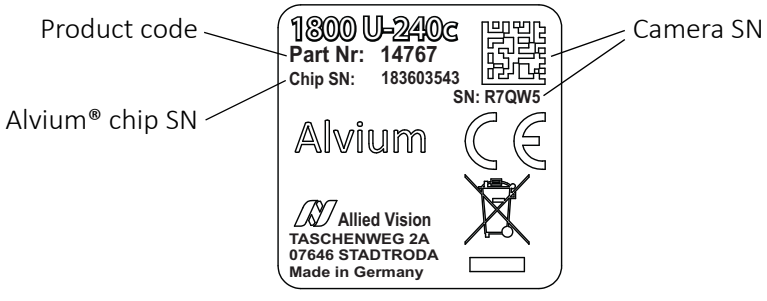


Figure 67: Sandwich label on blister packs shipped for bare board cameras

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). 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: Combine the four digits (b) with the five digits (c). In the example, the serial number is 183603543.

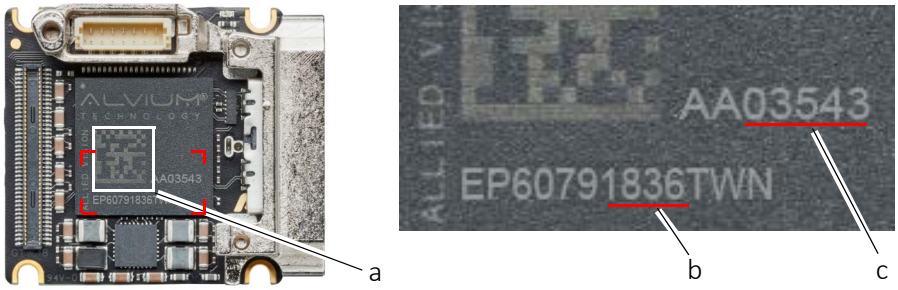


Figure 68: Alvium® chip imprint with detail view (right)

Future bare board cameras follow the convention shown in Figure 69. String (d) is the serial number, in the example, it is 205203543.

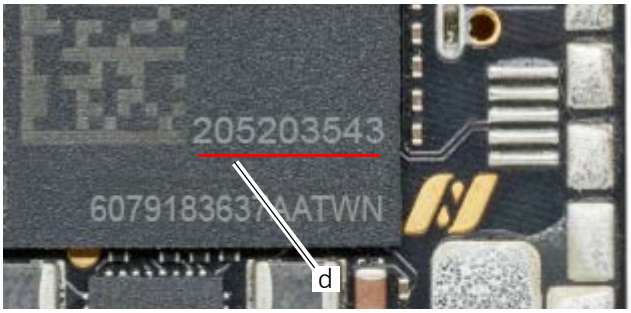


Figure 69: Alvium® chip imprint version 2

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 areas.
- 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 areas (blue areas in Figure 70) to a heat sink, following the instructions of the manufacturer of the heat sink and the thermal conductive media. Cooling areas for Alvium USB 90° models are the same as for standard models.

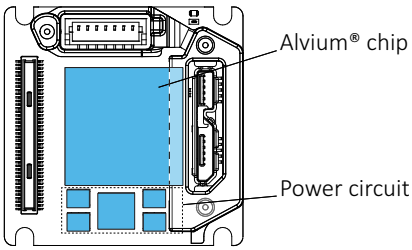


Figure 70: Cooling areas for Alvium USB bare board cameras

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 203.
- 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 Housed Alvium Cameras application note.

For 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.

Schematic drawings in Figure 71 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

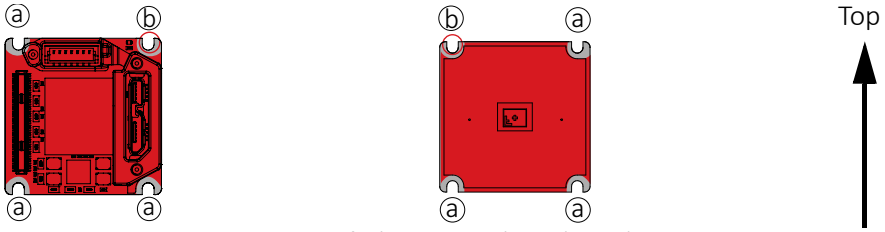
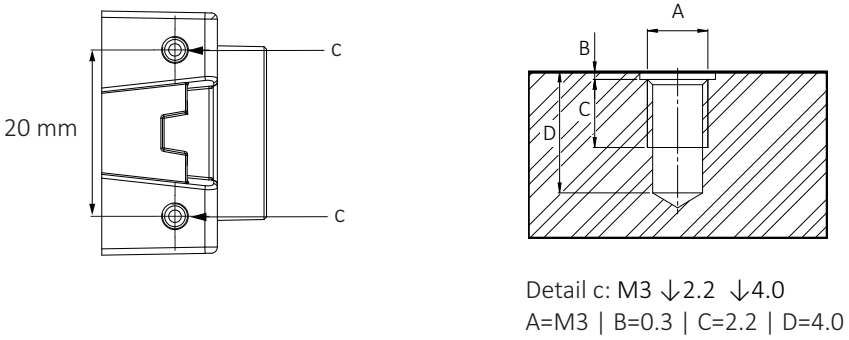


Figure 71: Mounting area of Alvium USB bare board cameras connector side (left); sensor side (right)

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 cameras

Bottom or top mounting



Detail c: M3 ↓2.2 ↓4.0
A=M3 | B=0.3 | C=2.2 | D=4.0

Figure 72: 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 203.

1. Mount the camera to the base using suitable M3 screws at 0.51 Nm maximum torque for a thread engagement (C) of 2.2 mm between screws and mounting threads, see Figure 72. For technical drawings, see Dimensions and mass on page 158.
2. Continue with Mounting the lens on page 204.

Front mounting

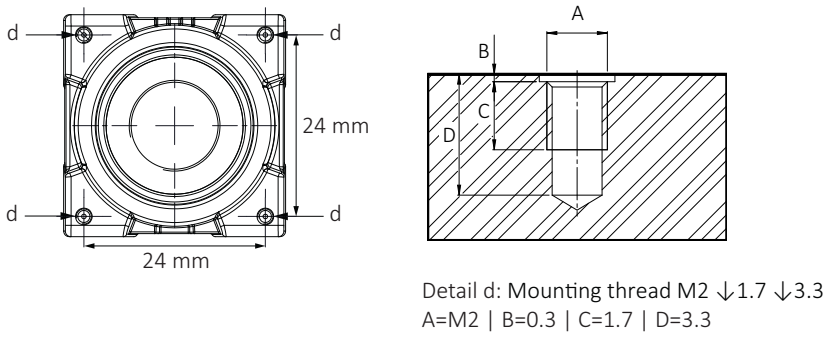


Figure 73: Camera front with mounting threads (d)

The maximum torque value applies only if the entire thread engagement is used. For other values, see Adapting maximum torque values on page 203.

1. Mount the camera to the base using suitable M2 screws at 0.17 Nm maximum torque for a thread engagement (C) of 1.7 mm between screws and mounting threads, see Figure 73. For technical drawings, see Dimensions and mass on page 158.
   We recommend you to additionally use bottom and top mounting threads for a more solid connection.
2. Continue with Mounting the lens on page 204.

Adapting maximum torque values

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

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

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

Example for a length of thread engagement of **1.4 mm** instead of 1.7 mm:
1.4 mm / 1.7 mm × 0.17 Nm = **0.14 Nm**

Thread group	Thread position	Thread type	Total protrusion	Length of thread engagement	Maximum torque
d	Front mounting	M2	2 mm	1.7 mm	0.17 Nm
d	Front mounting	M2	2 mm	**1.4 mm**	**0.14 Nm**

Table 104: Adjusting maximum torque values

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

Tripod adapter

For more information, see the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

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 Lens mounts and maximum protrusion on page 176.
- S-Mount lenses must be screwed into the camera at less than maximum protrusion (11.0 mm), see Mounting and focusing S-Mount lenses on page 205.
- 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/User_Guide/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 74 shows how fixing nuts lock S-Mount lenses.

Follow the instructions to lock the lens in focus position.

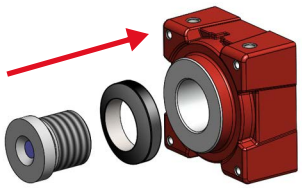


Figure 74: Fixing nut locking an S-Mount lens

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 Lens mounts and maximum protrusion on page 176.
3. Set a gauge to the length of (a).

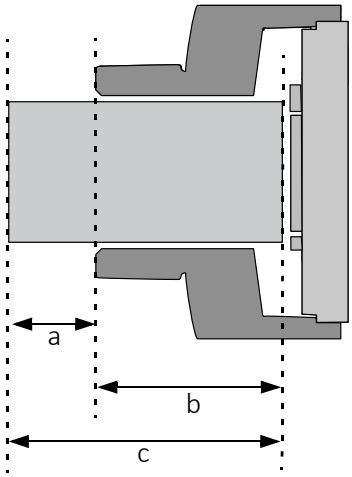


Figure 75: S-Mount lens and maximum protrusion

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 76: 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.

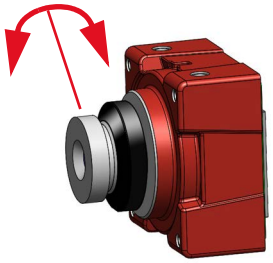


Figure 77: Adjusting focus

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.

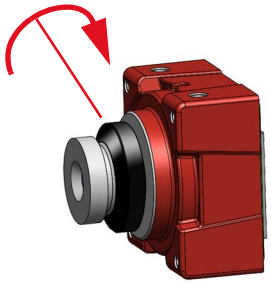


Figure 78: Tightening the fixing nut

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.

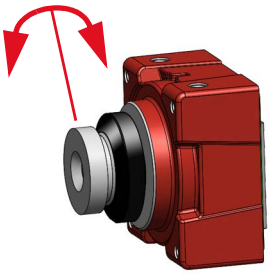


Figure 79: Checking lens is safely locked

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

This section lists general requirements to operate Alvium USB cameras on your system.

To download **Vimba Suite** for Windows, Linux, and Linux/ARM, including **Vimba SDK**, **Vimba Viewer**, and **Vimba Driver Installer** for Windows, see www.alliedvision.com/software.

For more details see **ReleaseNotes_Linux.txt** or **ReleaseNotes_Windows.txt** in the directory of your **Vimba** installation, or see www.alliedvision.com/software.

Required components

Driver installation and OS support

Windows: Please use **Vimba** to install the camera driver. For **Vimba** system requirements and supported Windows versions, see www.alliedvision.com/software.

Linux: Allied Vision does not provide a special driver. For **Vimba** system requirements and supported operating systems, see www.alliedvision.com/software.

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 the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

Installing the camera driver using Vimba on a Windows system

Instructions in this chapter describe installation of the camera driver using **Vimba** 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 229.

Using the camera with third-party drivers

Alvium USB cameras may not support third-party drivers. We recommend using the **Vimba** camera driver.

Installing drivers for camera and host adapter

Installing the host adapter and Vimba

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**: www.alliedvision.com/software.
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** 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 also provides a command line driver installer. For more information about the **Vimba Driver Installer**, see the Vimba Manual, included in the **Vimba** download.

During the **Vimba** installation, select at least **Camera Demonstration** and **Vimba 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 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** 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.

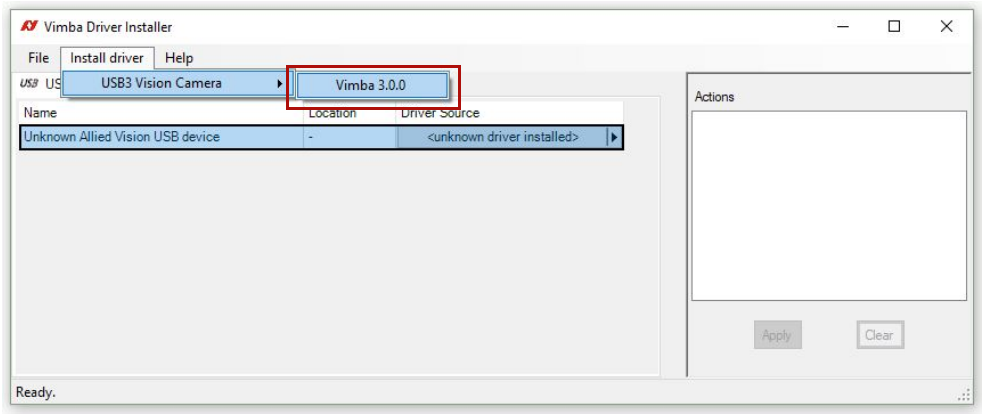


Figure 80: Vimba Driver Installer, camera driver not installed

5. Click **Apply** to install the **Vimba** driver for the camera.

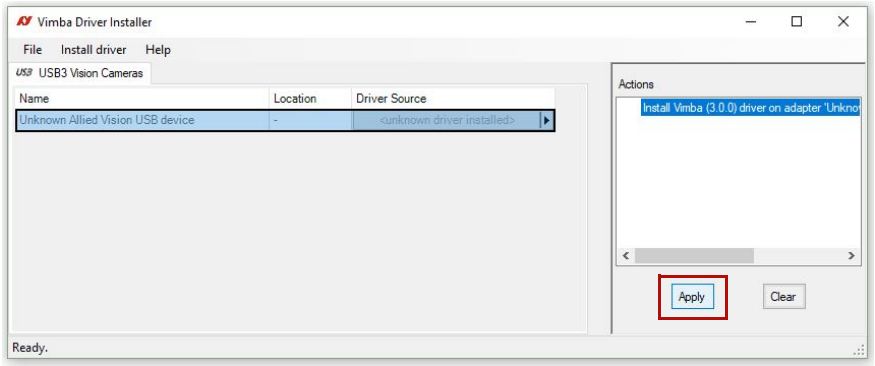


Figure 81: Vimba Driver Installer, driver installation started

The driver has been installed successfully, the camera is recognized.

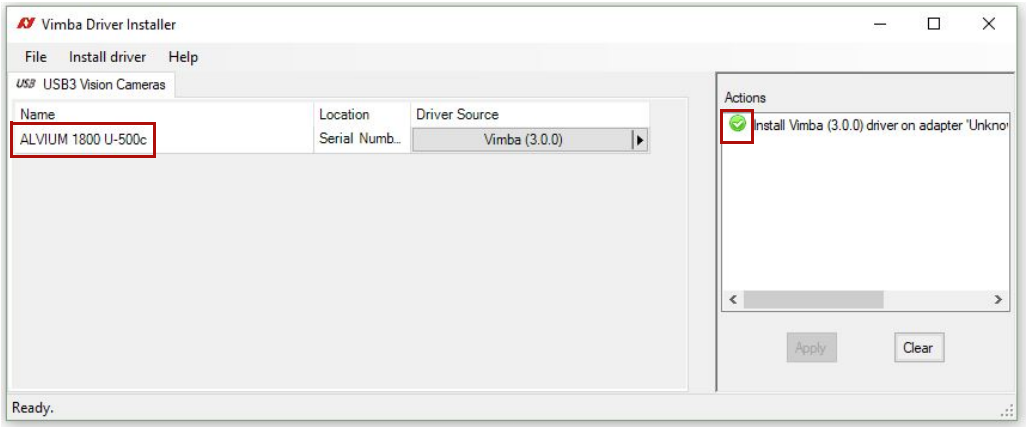


Figure 82: Vimba Driver Installer, driver installed successfully

Manual Vimba Driver installation

Windows: For manual **Vimba** driver installation, see the following instructions.

Installing the camera driver with Windows tools

As an alternative practice, you can install the **Vimba** 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** USB device driver is not installed, the camera is not recognized.

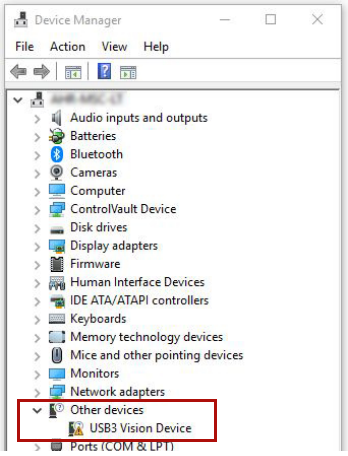


Figure 83: Windows Device Manager, unrecognized USB3 Vision camera

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 83.

3. Right-click the unrecognized **USB3 Vision Device** and select *Update driver*.

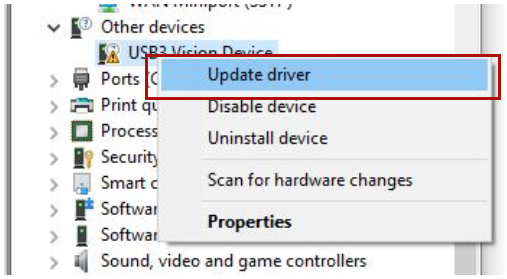


Figure 84: Windows Device Manager, Windows Driver Installer

4. Click: “Browse my computer for driver software”.
5. Select [Your local Vimba directory]\Allied Vision\Vimba_V.x.x\VimbaUSBTL\Driver.
6. Follow the instructions.
   The camera driver is installed successfully.

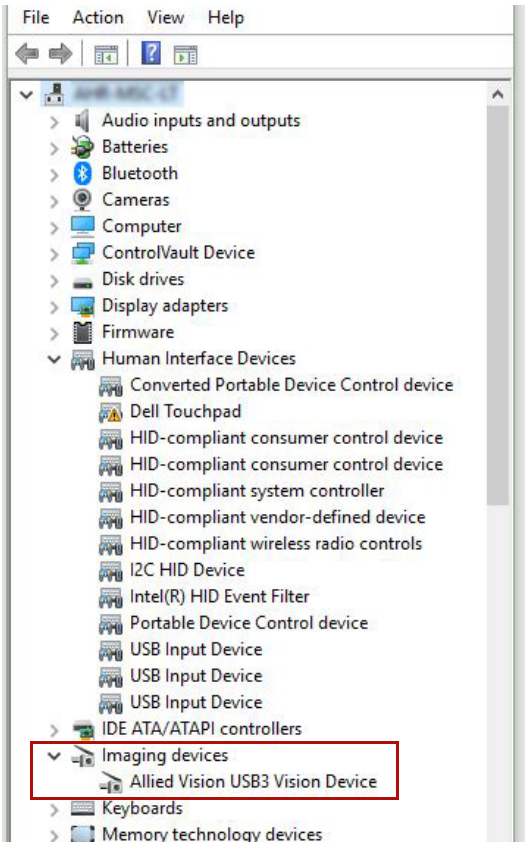
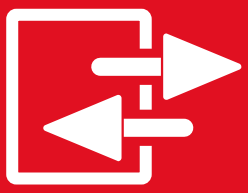


Figure 85: Windows Device Manager, USB3 Vision camera installed successfully

Camera interfaces



This chapter includes:

Recommended accessories

Compatible electronics accessories

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

Back panel

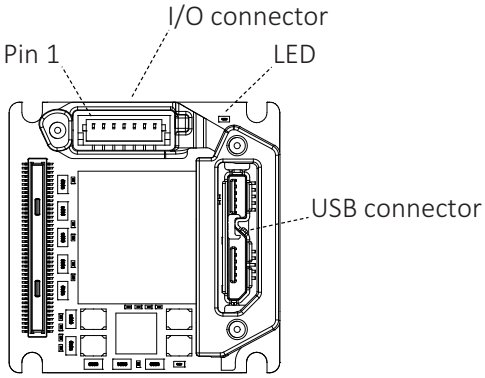


Figure 86: Bare board camera

Interface descriptions

Interface	Section in this user guide
I/O connector	Non-isolated, programmable GPIOs on page 218
Status LED	Status LED on page 220

Table 105: Interface descriptions overview

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 106 on page 216. Typical RS232 voltage levels (such as ±10 VDC) are not supported without external circuitry.

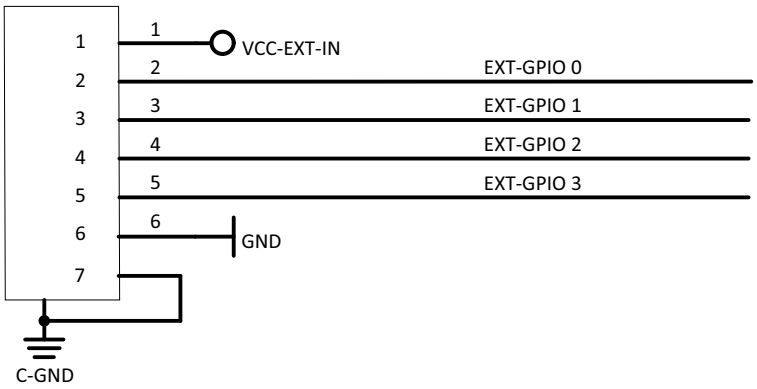


Figure 87: Pin assignment of JST BM07B-SRSS-TBT type I/O connector

Pin	Signal	Direction	Level	Description
1	VCC-EXT-IN	PWR IN	4.5 to 5.5 VDC See Power supply voltage for I/O cables on page 217.	Power supply voltage See Camera power on page 44.
2	EXT-GPIO 0	IN/OUT	U_{in} (low) = -0.3 to 0.8 VDC U_{in} (high) = 2.0 to 5.5 VDC U_{out} (low) = 0 to 0.4 VDC U_{out} (high) = 2.4 to 3.3 VDC at max. 12 mA	GPIOs Internal pull-up resistor: 33 kΩ to 63 kΩ
3	EXT-GPIO 1	IN/OUT	See Pin 2, EXT-GPIO 0	
4	EXT-GPIO 2	IN/OUT	See Pin 2, EXT-GPIO 0	
5	EXT-GPIO 3	IN/OUT	See Pin 2, EXT-GPIO 0	
6	GND	PWR	0 VDC	Power supply ground
7	C-GND	PWR	0 VDC	Chassis ground and shielding

Table 106: Pin assignment of the JST BM07B-SRSS-TBT type I/O connector

I/O use for UART

Table 107 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 107: 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 108.

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
12320	1.0 m	7-Pin JST I/O cable with screw lock to open ends	4.5 to 5.5 VDC
12321	2.0 m		
12322	3.0 m		
17070	5.0 m	7-Pin JST I/O cable with screw lock to open ends	5 to 5.5 VDC

Table 108: 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 88. The push-pull GPIOs are able to source or sink current from an external pin.

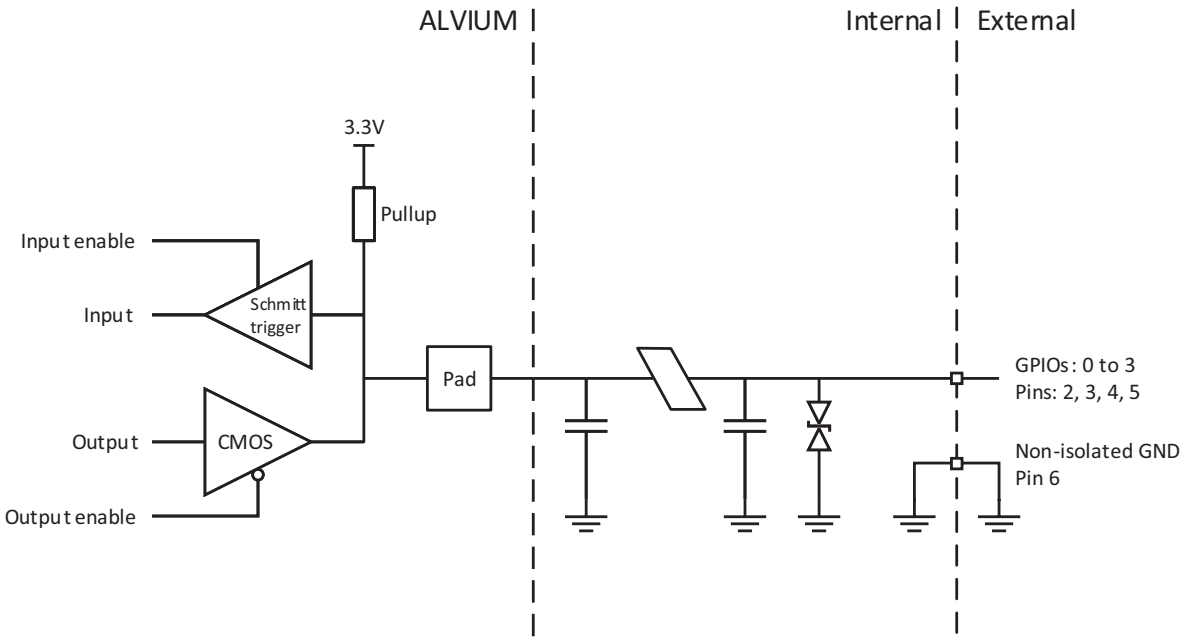


Figure 88: GPIOs block diagram

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 109: 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 110: 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:

- A value of *10* enables LED signaling at the highest luminance level.
- Values below *10* reduce the luminance level.
- *0* disables LED signaling.

Normal operation

LED codes	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 111: 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.

Triggering

This chapter includes:

Trigger signal flow

Figure 89 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.

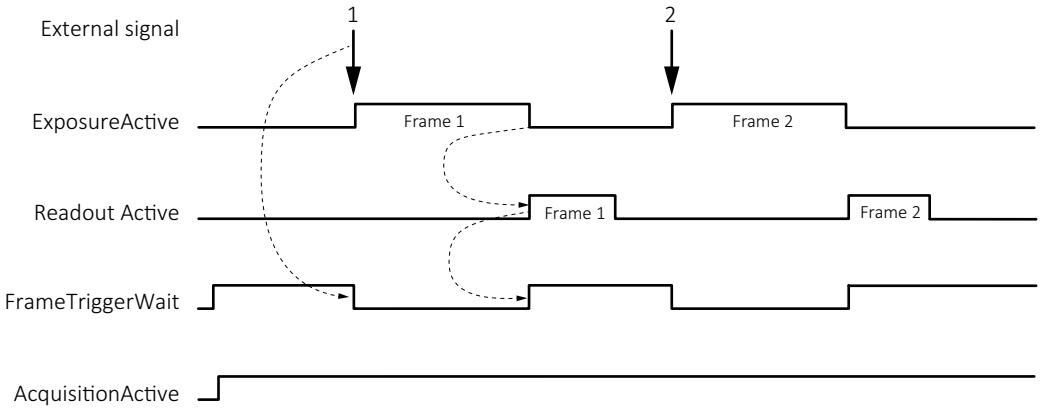


Figure 89: Schematic trigger signal flow

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 112: 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 223.

Trigger features and UserSetDefault

See Trigger features and UserSetDefault on page 180.

Trigger delay with 1800 U-120 cameras

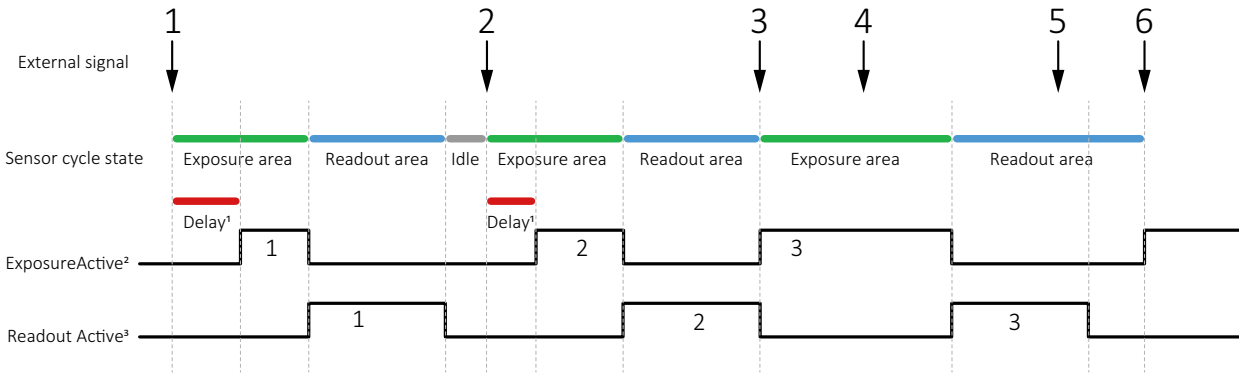
If sensor related parameters are changed **directly before** sending an external trigger, the trigger delay can be increased. This relates to Frame rate jitter on page 230.

Triggering with rolling shutter cameras

This section describes triggering behavior for **1800 U-500m/c, U-501m NIR, U-1240m/c, and U-2050m/c**. Figure 90 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.



¹Exposure start delay
²Active when all lines are exposing simultaneously. Therefore, ExposureActive is shorter than ExposureTime.
³Logical state, not a user feature

Figure 90: 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 113: 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

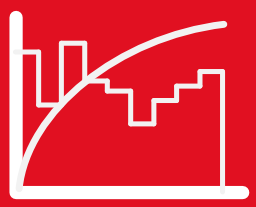
When rolling shutter cameras are operated in triggered mode, the values for maximum frame rate reached in free run mode are cut in half.

Ignored triggers

Alvium 1800 U-500m/c, U-501m NIR, U-1240 m/c, and U-2050m/c

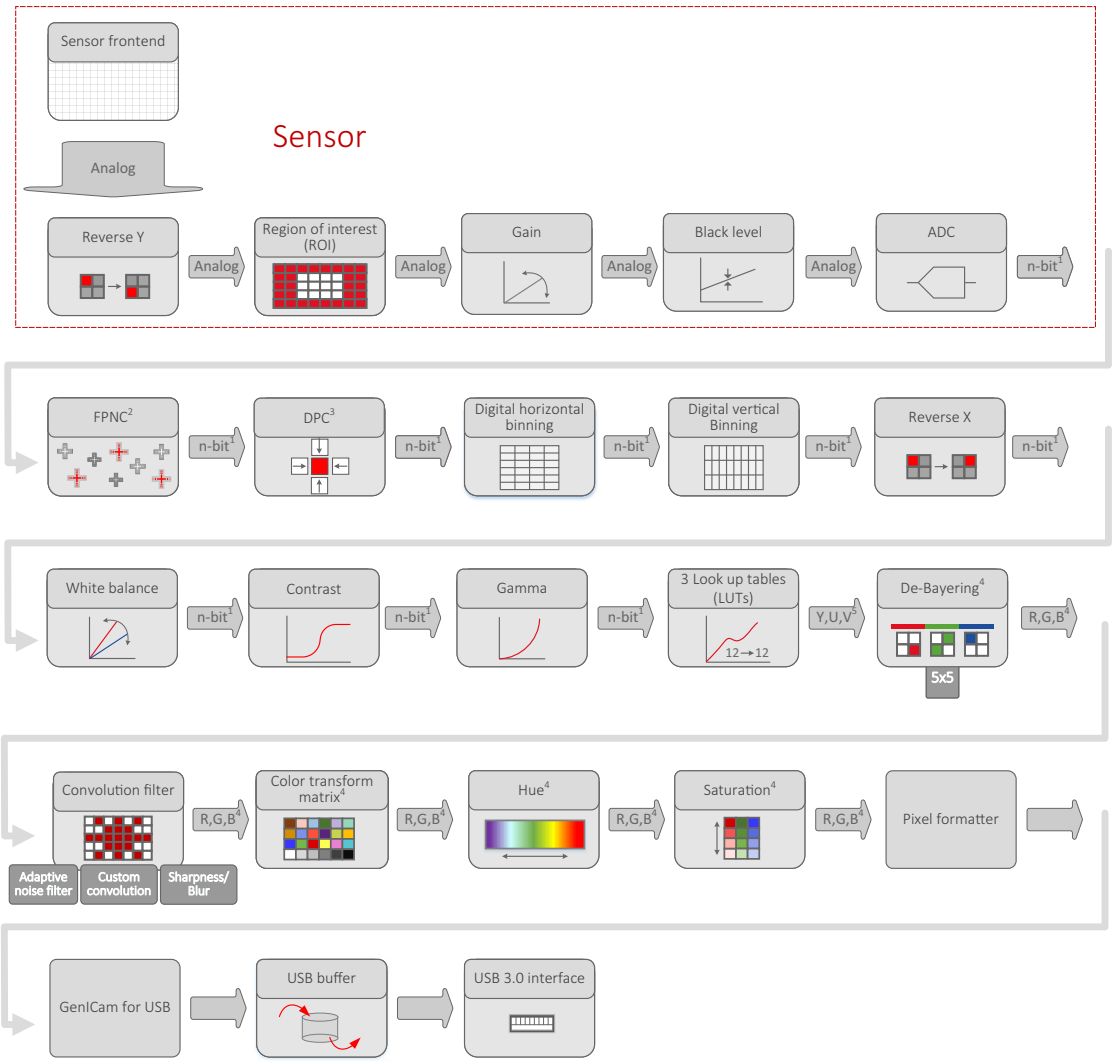
Changing parameters while acquisition is active leads to ignored triggers until the parameters get active.

Image data flow



This chapter includes the image data flow for Alvium USB cameras.

Figure 91 shows image data processing for Alvium USB cameras in general.



[1] Model dependent: See ADC bit depths in the Specifications chapter.

[2] Factory preset for FPNC = Fixed Pattern Noise Correction
FPNC is **currently not supported** by Alvium 1800 U-030 VSWIR, 1800 U-052, 1800 U-130 VSWIR, 1800 U-291, 1800 U-2050.

[3] Factory preset for DPC = Defect pixel correction
DPC is **currently not supported** by Alvium 1800 U-052, 1800 U-291.

[4] Color models only

Figure 91: 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.

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 the computer running while you are executing a firmware update.
- 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

We recommend you to install **Vimba** completely.

Vimba Driver Installer

Windows: By default, **Vimba Driver Installer** is installed as well.

1. Download and install **Vimba**.
   The download includes the **Vimba Firmware Updater** and the Vimba Manual.
2. To update the firmware, follow the instructions of the Vimba Manual.

Downloads

- For Vimba, see www.alliedvision.com/software.
- For firmware updates, see www.alliedvision.com/en/support/firmware.

- We recommend you to use the **Vimba Firmware Updater** for easy handling. If you want to update the firmware without installing **Vimba**, please contact support at www.alliedvision.com/en/about-us/technical-support-repair-/-rma.

If firmware update fails,

- The camera is shown as “Fallback” on the USB bus.
- The camera is not recognized by **Vimba Viewer**.
- You can repeat the firmware update.

Should the firmware update not succeed, please contact support at www.alliedvision.com/en/support.

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.

Frame rate jitter

Alvium 1800 U-120m/c, U-500m/c, U-501m NIR, U-1240 m/c, and U-2050m/c

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.

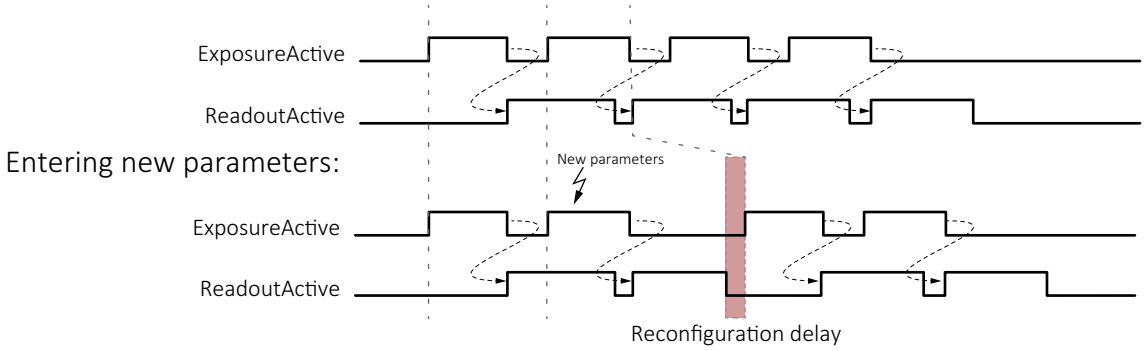


Figure 92: Delayed exposure due to parameter changes

Parameter changes in triggered mode

See Ignored triggers on page 224 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 93 shows the interdependencies.

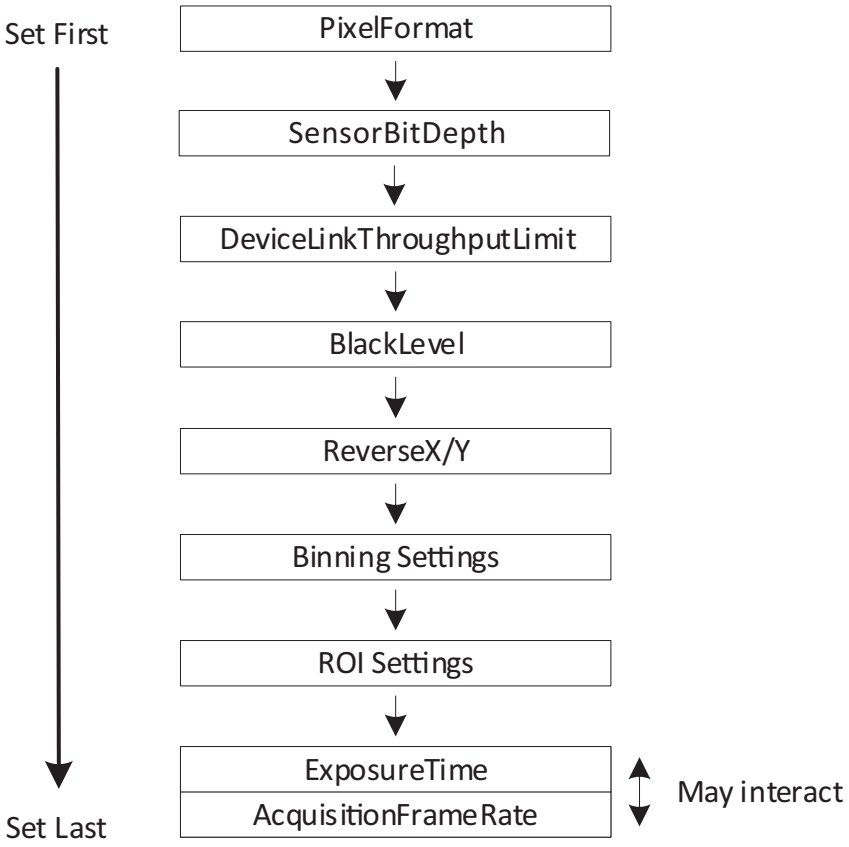


Figure 93: Interdependencies between features

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 93.

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 114: Impact by other features

Exposure times and frame rates with Sony IMX rolling shutter cameras

Alvium 1800 U-1240 m/c, and U-2050m/c

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 234.

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

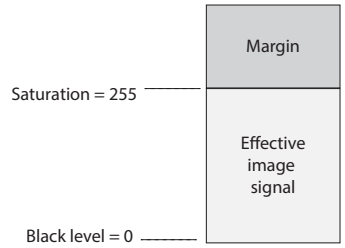
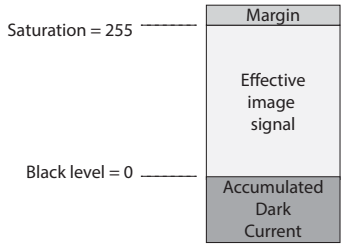
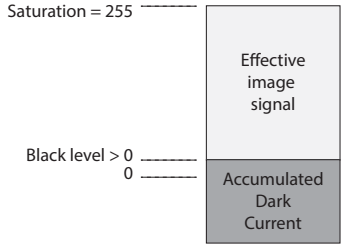
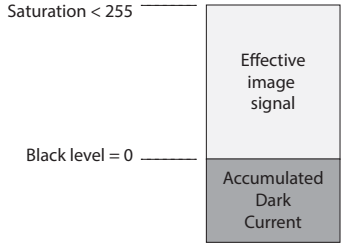
Effective signal versus noise	Description
	The pixel has accumulated no dark current, the margin has maximum size.
	The pixel has accumulated some dark current, reducing the size of the margin.
The following images show a pixel that has accumulated a higher dark current than the margin.	
	The pixel has accumulated dark current, the margin reduces to 0. **Type 1 compensation** • Dark current compensation is stopped. • Dark current increases the black level. • Fixed pattern noise increases.
	The pixel has accumulated dark current, the margin reduces to 0. **Type 2 compensation** (Typically used for sensor-internal compensation, often in the analog domain.) • Dark current compensation stays active. • Maximum saturation signal decreases. • Fixed pattern noise increases.

Table 115: 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 234.

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 116 shows the effect of the black level compensation. Should additional compensation be needed, we recommend cooling the camera.

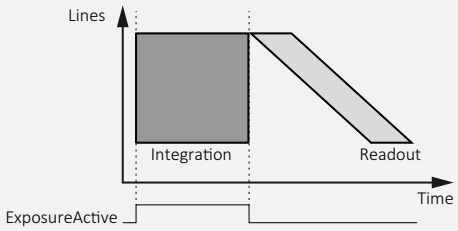
Temperature [°C]	ExposureTime [ms]							
	1	10	50	100	250	500	750	1,000
35								
40								
45								
50								
55								
60								
65								
70								
75								

	Full compensation
	Partial compensation

Table 116: Exposure time and temperature affecting black level compensation

Shutter types affecting image readout

Some Alvium USB camera models are operated using global shutter (GS):

Property	Line readout	Moving image
Global shutter (GS)		

Other models use rolling shutter (RS). Alvium 1800 U-2050 models with Sony IMX183 sensor offer global reset shutter (GRS) in addition:

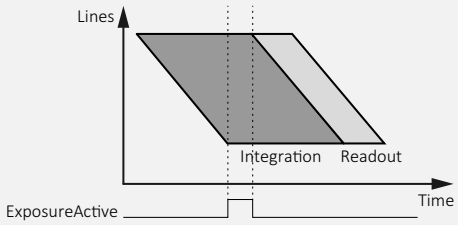
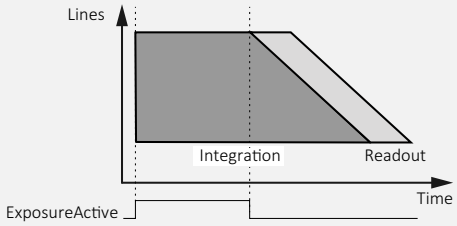
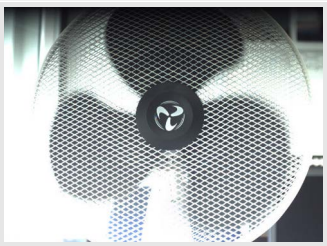
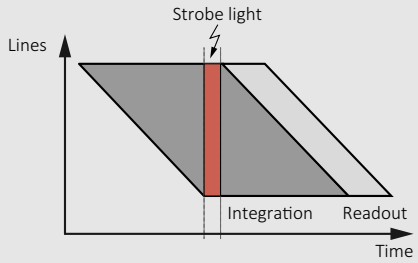
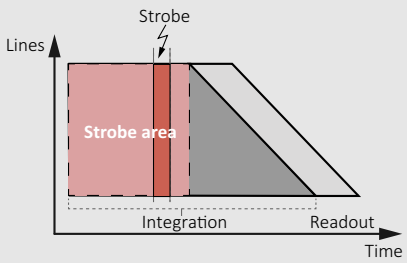
Property	Rolling shutter (RS)	Global reset shutter (GRS)
Line readout		
Line exposure start	Deferred from line to line	Common for all lines
Line exposure time	Common for all lines	Increases from line to line
Image acquisition of moving objects		
Image brightness	Constant over the image	Varying over the 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:  	

Table 117: 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 94 shows the bandwidth for a higher (1) and a lower (2) value for `DeviceLinkThroughputLimit`.

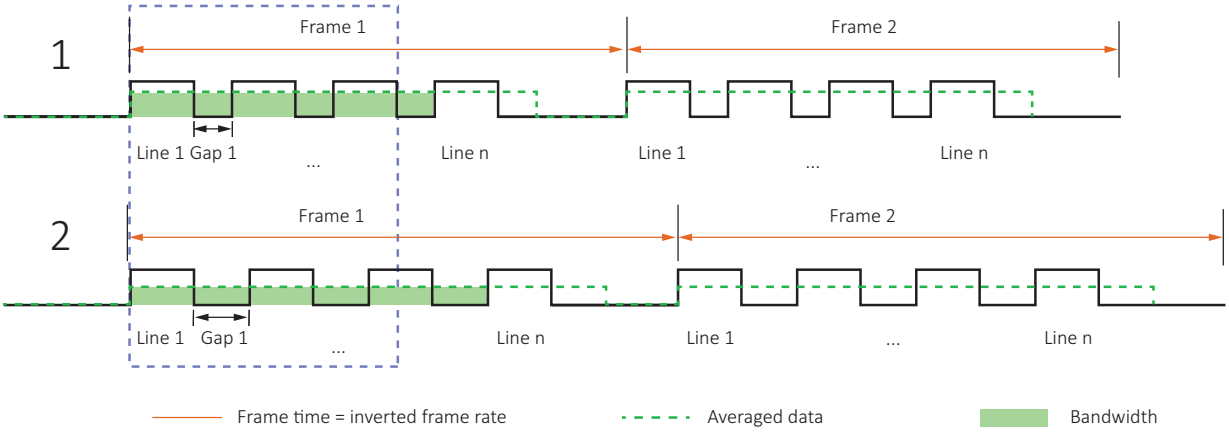


Figure 94: Sensor data output and camera data output

- 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 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 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 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 MBps are required to reach maximum frame rates for some Alvium USB camera models. Adding the typical overhead for USB communication, even 500 MBps can be insufficient. We recommend using roughly **1 GBps per camera**.

In Table 118 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	250MB/s	500MB/s	0.99/GB/s
× 2	500MB/s	1GB/s	1.97GB/s
× 4	1GB/s	2GB/s	3.9GB/s

Table 118: 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.

Dividing bandwidth between devices on a common USB 3.0 or 3.1 Gen 1 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 percent bus bandwidth.
- Cameras need 100 percent 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 percent bandwidth each.
  For three cameras, the bandwidth is 33.3 percent each.
- If one camera sends no data, the other camera will be assigned 100 percent bandwidth. To always assign 50 percent to both cameras, they have to be controlled to use no more than 50 percent 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 the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.
- 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.

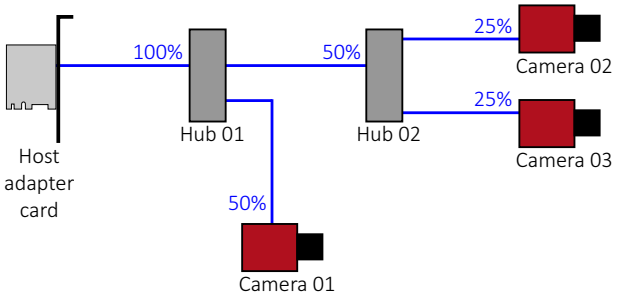


Figure 95: Bandwidth assignment for cascading hubs

Using the U3 mode

If you want to pause camera operation, you can use the U3 mode to reduce the power consumption of Alvium USB cameras to ~ 16 mA. 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	*Table 119: Description*
`Disabled`	The camera uses standard power (default).
`SuspendMode`	The camera is enabled to go into to USB U3 power saving mode.[1]

Table 120: Options for DevicePowerSavingMode

Please observe

- To operate the camera again after using U3 mode, the camera reboots itself. After reboot, all camera settings are reset to default values, `DevicePowerSavingMode` is reset to *`Default`*.
- The U3 mode is not supported for USB 2.x connections.

Linux: Activating U3 mode

1. Connect to the camera and use as you like.
2. Set `DevicePowerSavingMode` to *`SuspendMode`*.
3. Close all **Vimba** Connections, including the first **Vimba 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

Linux: Reactivating operational mode

Open **Vimba Viewer**.

The camera boots up. This may take about 2 seconds.

Windows: Activating U3 mode

1. Connect to the camera and use as you like.
2. Set the `DevicePowerSavingMode` to *SuspendMode*.
3. Close all **Vimba** Connections, including the first **Vimba Viewer** dialog.
4. In the **Device Manager**, click **Disable Device** for the Allied Vision USB3 Vision Device:

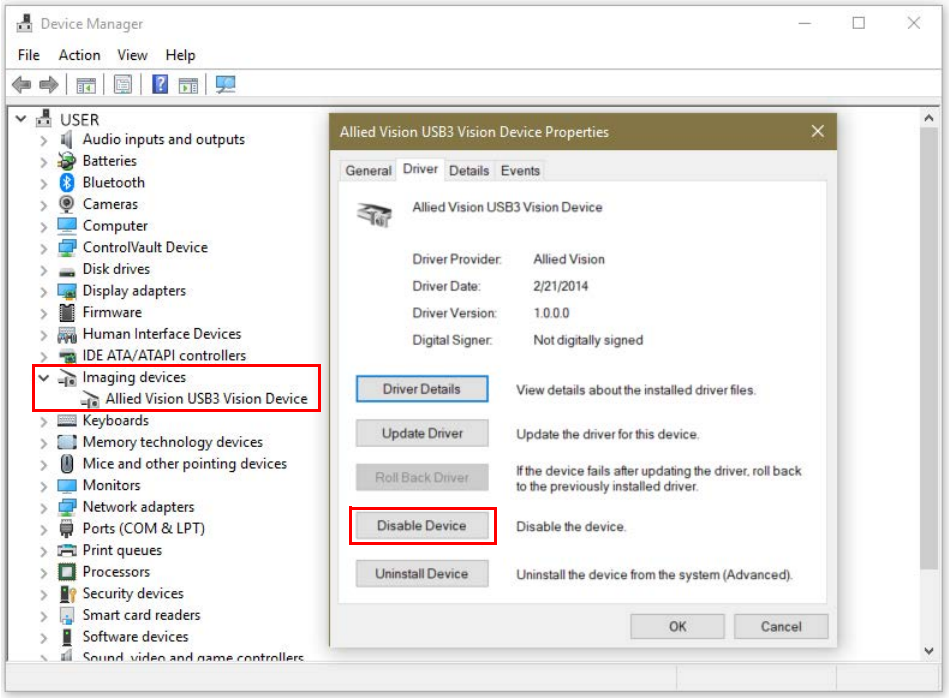


Figure 96: Disabling the Alvium camera in the Device Manager

Windows: Reactivating operational mode

1. In the **Device Manager**, click **Enable Device** for the Allied Vision USB3 Vision Device:

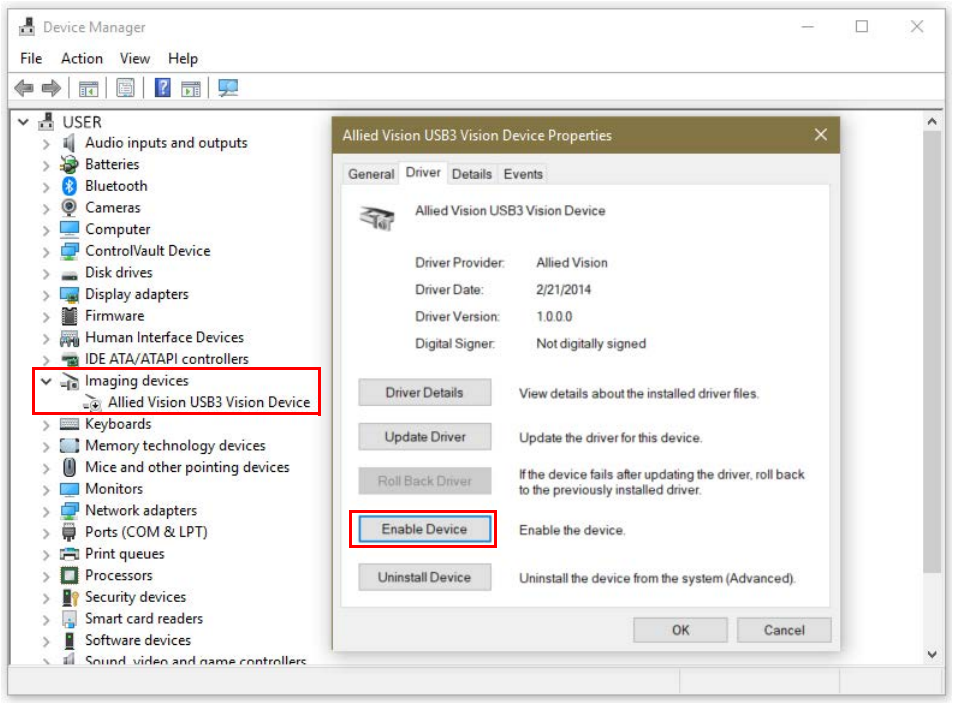


Figure 97: Enabling the Alvium camera in the Device Manager

2. Open **Vimba 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 213 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 197.

Camera recognition

How can I make the computer and Vimba 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 243.

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

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 on page 209.

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 211.
   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 243.

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 236.

2. The camera is **connected to a USB 2.0 port** and requires a bandwidth higher than 50 MBps.

   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 the Alvium USB Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

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 237.

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 Dividing bandwidth between devices on a common USB 3.0 or 3.1 Gen 1 bus on page 238.

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 Dividing bandwidth between devices on a common USB 3.0 or 3.1 Gen 1 bus on page 238.

5. Check if all your USB **accessories support USB 3.0 or 3.1 Gen 1**.

   For recommended USB accessories, see the Alvium Cameras Accessory Guide www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

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 the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation.

Index