

## APPLICATION NOTE

Optimum Heat Dissipation for  
Alvium CSI-2, USB, and G1 CamerasV2.3.0  
2023-Sep-27

## Scope

Cameras heat up during operation, which reduces image quality and increases power consumption. Excessive heat can even damage cameras. Heat dissipation reduces the camera temperature during operation. This document provides information for heat dissipation with Alvium housed cameras.

This document applies to Alvium cameras with all digital interfaces, except for Alvium G5/G5X..

**Heat dissipation for Alvium G5/G5X cameras**

For a corresponding application note and for compatible heat sink kits, see [www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation](http://www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation).

**Bare board cameras**

For bare board cameras, please contact technical support at [www.alliedvision.com/en/about-us/contact-us/technical-support-repair/-rma](http://www.alliedvision.com/en/about-us/contact-us/technical-support-repair/-rma).

## Alvium operating temperature specifications

Specifications stated in the corresponding Alvium user guides reflect the results from [Temperature tests](#).

If the mainboard temperature exceeds the specified maximum value for more than 2 seconds, the camera is powered off automatically. You can use this value to control cooling by software, for example, to control a fan.

**Alvium camera documentation**

For detailed information on Alvium cameras, see your camera's user guide at [www.alliedvision.com/en/support/technical-documentation](http://www.alliedvision.com/en/support/technical-documentation).

**Evaluation heat sink for Alvium G1 cameras**

For a compatible heat sink kit, see [www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation](http://www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation).

## Temperature tests

Figure 1 shows how temperature was measured with an Alvium USB closed housing camera. Alvium CSI-2 and Alvium G1 cameras were tested the same way. Tests were performed in a climate chamber with no air flow. The cameras were heated up to the maximum housing temperature stated in the model specifications of the corresponding Alvium user guides.

The camera housing temperature is measured:

- At the hottest spot of the housing
- At the mainboard, using `DeviceTemperature` (Vimba Access) or using `Device Temperature` (Direct Register Access).

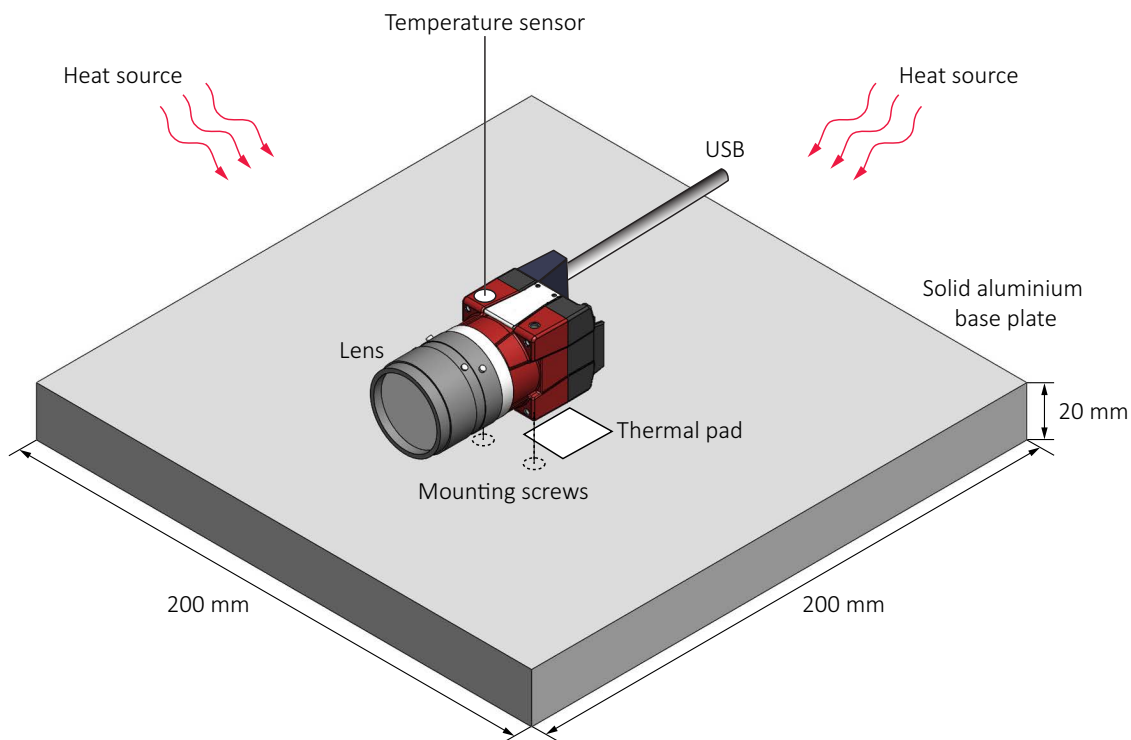


Figure 1: Testing temperature for closed housing Alvium cameras (schematic, non-isometric view)

## Individual applications

Heat dissipative design is complex. Many factors have an impact that can often not be specified. In this case, calculations provide a rough estimation.

## Best practice rules for heat dissipation

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

- Mounted to a base with a high thermal conductivity
- With a lens or other optical components mounted
- With a heat sink mounted that has large surface areas, see [Mounting heat sinks for open housing and bare board cameras](#) on page 4
- Using conductive media for camera and heat sink mounting

- With active cooling of camera, mounting base, and heat sink, such as by ventilation
- Design open housing cameras into a heat dissipative housing with a high thermal conductivity. For closed housing cameras, encompassing heat dissipative housings can extend the supported temperature range.
- Keep the operating temperature in the specified range to enable best image quality and to enable a long camera life.

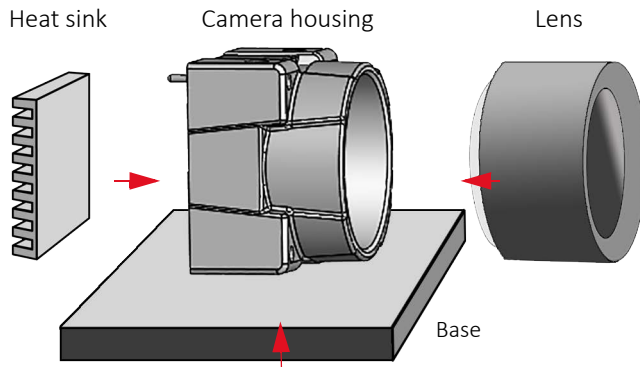


Figure 2: Camera setup for proper heat dissipation

## Requirements for heat sinks and mounting bases

Ensure that heat sinks mounted to cooling area dissipate heat in proportion to total power consumption:

- 75% for open housing cameras
- 100% for bare board cameras.

For cameras with >3.5 W power consumption, mount the camera to a base with a high thermal conductivity, using the

- Mounting surfaces of housed cameras
- Mounting area of bare board cameras (see [Figure 3](#)).

The required efforts depend on the mounting scenario and the ambient temperature. See [Best practice rules for heat dissipation](#) on page 2.

## Mounting area of bare board cameras

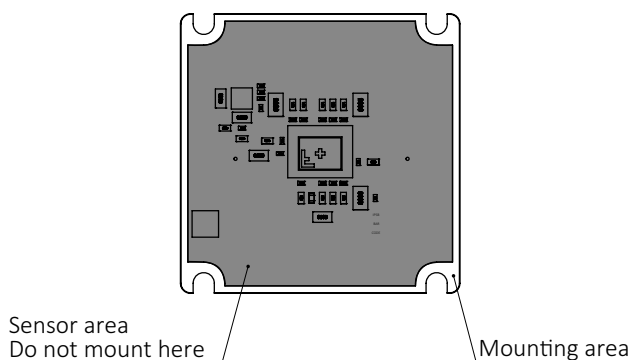


Figure 3: Mounting area for Alvium bare board cameras

## Mounting heat sinks for open housing and bare board cameras



### NOTICE

#### Damage to the camera by heat sinks mounted improperly

- Allow mechanical contact only at the cooling area.
- Avoid any mechanical stress to the sensor and electronics area.
- Avoid short circuits of the electronics components.



### NOTICE

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

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

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



### NOTICE

#### Damage to camera electronics

Heat sinks can cause short circuits if they are not electrically isolated.

Avoid electrical contact between electronic components by unsuitable heat sinks and thermal conductive media.

Connect components in the **cooling area** (blue area in [Figure 4](#)) to a heat sink, following the instructions of the manufacturer of the heat sink and the thermal conductive media.

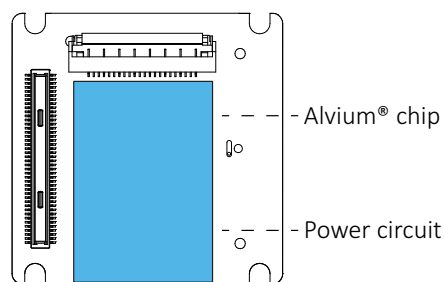


Figure 4: Cooling area for Alvium cameras



#### Heat sink compound

Because electronic parts vary in height, we have updated our recommendation:

- Use flexible heat sink compound to compensate for potential gaps between the electronic parts to be cooled and heat sinks.
- Consider 1 mm to cover for worst case scenarios.
- For details, see the Alvium STEP files ([Table 1](#) on page 5).

## What else do you need?

This is a selection of helpful downloads:

Download or information	Link
<b>Operating Alvium cameras</b>	
Alvium CSI-2 Cameras User Guide Alvium FP3/GM2 Cameras User Guide	<a href="http://www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation">www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation</a>
Alvium G1 User Guide	<a href="http://www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation">www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation</a>
Alvium USB Cameras User Guide	<a href="http://www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation">www.alliedvision.com/en/support/technical-documentation/alvium-usb-documentation</a>
<b>Hardware design in</b>	
<b>Alvium STEP files</b>	<a href="http://www.alliedvision.com/en/support/alvium-step-file-downloads">www.alliedvision.com/en/support/alvium-step-file-downloads</a>
<b>Various</b>	
Technical documentation and downloads overview	<a href="http://www.alliedvision.com/en/support/technical-documentation">www.alliedvision.com/en/support/technical-documentation</a>
Accessories	<a href="http://www.alliedvision.com/en/products/accessories">www.alliedvision.com/en/products/accessories</a>

Table 1: Downloads for Alvium cameras

## Contact us

### Website, email

**General**

[www.alliedvision.com/en/contact](http://www.alliedvision.com/en/contact)

[info@alliedvision.com](mailto:info@alliedvision.com)

**Distribution partners**

[www.alliedvision.com/en/avt-locations/avt-distributors](http://www.alliedvision.com/en/avt-locations/avt-distributors)

**Support**

[www.alliedvision.com/en/support](http://www.alliedvision.com/en/support)

[www.alliedvision.com/en/about-us/contact-us/technical-support-repair/-/rma](http://www.alliedvision.com/en/about-us/contact-us/technical-support-repair/-/rma)

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