Optimum Heat Dissipation for Alvium G5 Cameras

Scope

Alvium G5 brings the performance of a 5GBASE-T camera into a compact sugar cube housing. Being more powerful than cameras with 1GBASE-T Ethernet interface, but equally reliable, Alvium G5 provides:

- High power efficiency
- State-of-the-art components for a long product life cycle
- High bandwidths for high resolution and frame rates.

If you intend to replace a 1GBASE-T camera by 5GBASE-T, you must consider heat. This document gives an overview of measures for heat dissipation.

Heat generation on Alvium G5

Heat generation is important because it causes:

- Increased image noise
- Shortened the camera lifetime, as the aging of electronic components is accelerated.

Basically, heat increases proportionally to power consumption. The power consumption for 5GBASE-T is higher than for 1GBASE-T, adding up to heat generation. Moreover, the Alvium G5 uses a form factor almost the same as for Mako.

Alvium G5 camera documentation

For detailed information on Alvium G5 cameras, see the Alvium G5 User Guide at www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation.

Heat dissipation for other Alvium cameras

For the corresponding application note, see
www.alliedvision.com/en/support/technical-documentation.

Alvium G5 temperature specifications

To prevent damage and ensure a long lifetime for the electronics, the camera is automatically powered off when the mainboard temperature exceeds 85 °C for more than 2 seconds. The `DeviceTemperature` feature can be used to monitor the camera temperature by software, such as **Vimba Viewer**.

This approximately equals 65 °C housing temperature, depending on various factors. The temperature values in Table 1 apply to a relative humidity of 0 to 80 percent that is non-condensing. .

Feature	Housing	Mainboard
Operating temperature	-20° C to +65° C	-20° C to +85° C

Table 1: Alvium G5 operating temperature specifications

Calculating the increase in camera temperature

In theory, the camera temperature increases by $\Delta\vartheta$ in relation to the ambient temperature as described in the formula:

$$\Delta\vartheta = R_{th} * P$$

Variable	Definition
$\Delta\vartheta$	Change in temperature
P	Power consumption of the camera, depending on the camera model and operating conditions, such as frame rate or the selected power supply (externally or by PoE)
R_{th}	Thermal resistance between the camera and the environment, depending on different factors, such as camera mounting, airflow, lens, or mounted heat sinks.

Table 2: Calculating the increase in camera temperature, variable definition

The following table lists some example values for common setups:

Setup description	Thermal resistance R_{th} [K/W]
Camera without lens	7.3
Camera with Tamron M118M25 C-Mount lens	6.5
Camera without lens mounted to a 200 × 200 × 200 mm^3 aluminum cube	2.4

Table 3: Thermal resistance for different application setups

Best practice for optimum heat dissipation

Various factors have an impact on heat dissipation. Consider that single measures add up!

Enlarging the camera surface

Table 4 shows how different measures reduce the increase in camera temperature..

Component	Housing	Reduction
Camera mounting base	Mount the camera to a base with high thermal conductivity. Metal structures, especially aluminum provide good thermal conductivity. For example, when the camera is mounted to an aluminum cube of 200 mm × 200 mm × 200 mm, the increase in camera temperature is reduced by 50% compared to an unmounted camera. **Conductive media add** to this effect.	50%
Lens	Tamron M118M25 C-Mount lens	10%
Heat sink	Alvium G5 Heat Sink Kit (product code 16185)	11%
	Alvium G5 Evaluation Heat Sink Kit (product code 16709)	23%

Table 4: Effect of measures for heat dissipation in percent

Heat sink kits

For compatible heat sink kits, see www.alliedvision.com/en/support/technical-documentation/alvium-gige-documentation.

Air flow

Airflow can cool down the camera effectively. However, the resulting decrease in temperature depends on many factors such as airflow speed, humidity and temperature.

Using a power supply instead of PoE

Alvium G5 cameras have a higher (~0.4 W) power consumption with PoE than with external power. This results in more heat. Using external power reduces heat generation by about 3%.

Any questions?

If you have any questions regarding heat dissipation for your Alvium G5 camera, please Contact us!
Our Allied Vision Sales and Application Engineering team is trained to give you the support you need.

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