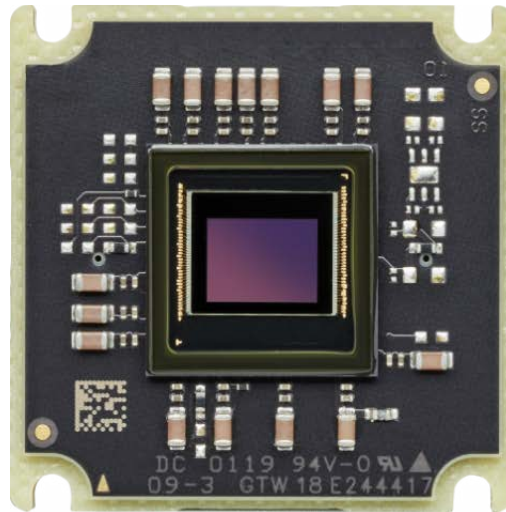


Designing in of Alvium Bare Board Cameras



Challenge of integrating bare board cameras

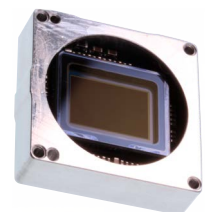
You want to design your own lens mount for Alvium cameras or your application does not need a lens mount? Especially with high resolution sensors, integrating bare board cameras into individual housings can be difficult. This document helps you make a good decision.

Like any solution for digital image processing, bare board cameras consist of numerous different components. Ideally, these components would have constant dimensions and would fit seamlessly to high precision products.

In practice, all parts have tolerances, invisible to the naked eye. For example, typical sensors are allowed to have a tilt of 1 degree according to the specification. Aligning the bare board to the lens is critical. Even micrometer deviations caused by sensor tolerances can reduce the image quality of a high-grade lens on a powerful sensor. Therefore, the bare board must be aligned to position the sensor.

Alvium Frame: Solution out of the box

Alvium Frame adds a square front flange to a bare board camera. It aligns to your individual housing with high accuracy. To give you all the flexibility you need, Alvium Frame is only 10 mm in depth.



Alvium Modular Concept

For more information on Alvium Frame, see www.alliedvision.com/fileadmin/content/documents/products/cameras/Alvium_common/modular-concept/Alvium-Modular-Concept_External.pdf.

Technical background

Axes for sensor positioning

The following schematics show parameters for sensor positioning. Alvim housings are used as an example.

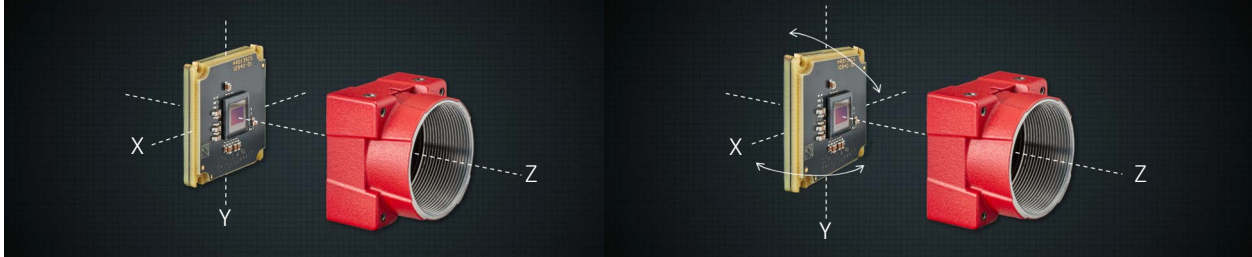


Figure 1: Accurate sensor alignment (left) and sensor tilt on the Z-Axis (right)

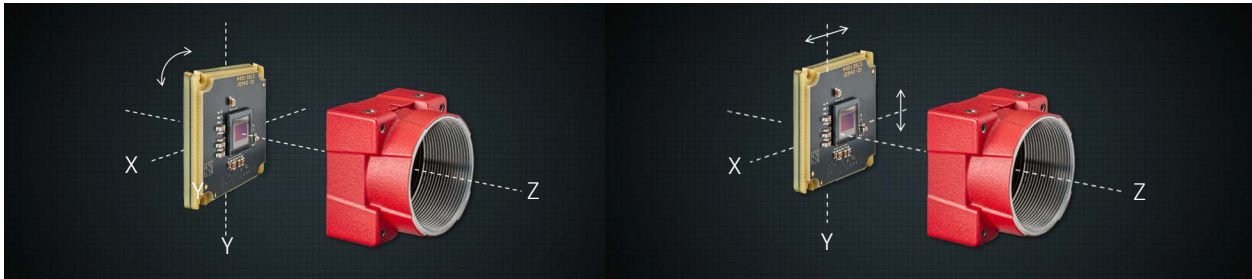


Figure 2: Sensor rotation around the Z-Axis (left) and sensor shift on the X-Axis or Y-Axis (right)

Effects of insufficient sensor alignment

To give you an idea how inaccuracies affect the image quality, we edited an example image without artifacts. The red rectangle in the left bottom corner marks the detail view used to simulate typical effects from insufficient sensor alignment.

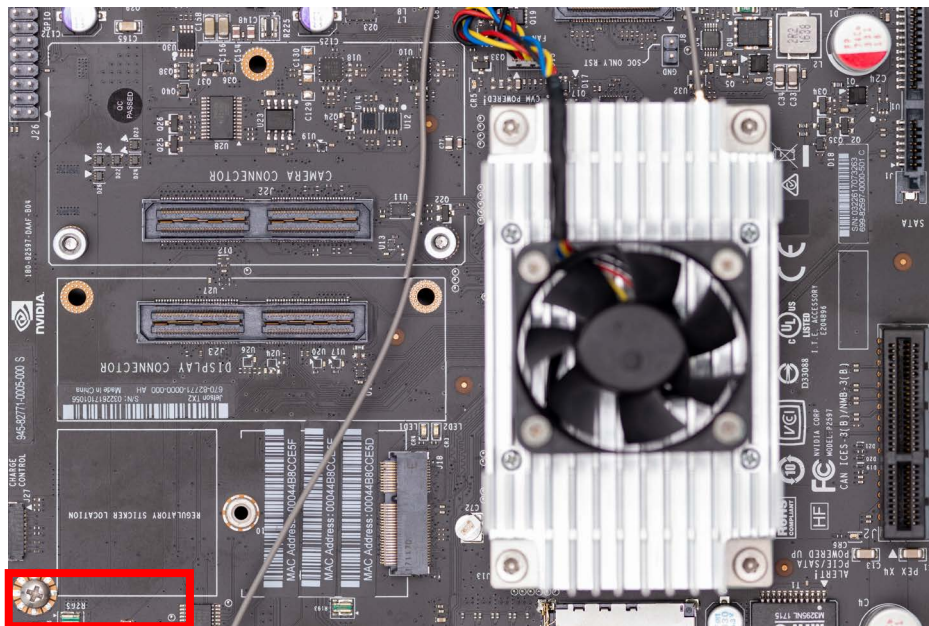


Figure 3: Image without sensor alignment issues

Comparing effects of insufficient sensor alignment

Accurate sensor alignment

The image shows no alignment issues.

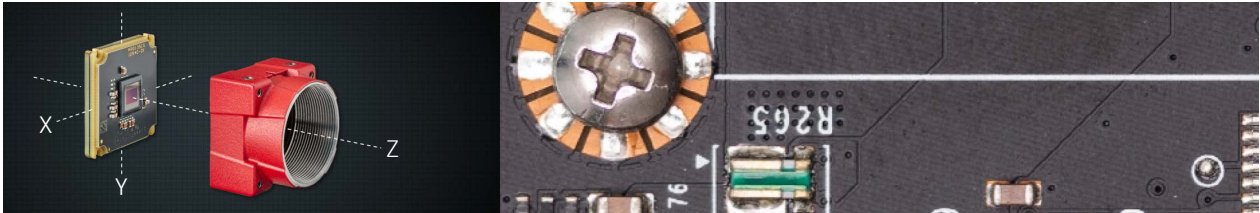


Figure 4: The sensor is accurately aligned to the optical axis of the lens

Tilt on the Z-Axis

The image has a variance of $90\ \mu\text{m}$ between the highest and lowest horizontal pixel of the sensor measured along the optical axis. This equals a rotation of 0.573 degrees around the Y-Axis. The resulting focus drift blurs the vertical edges



Figure 5: The sensor is tilted to the lens mount

Rotation around the Z-Axis

The image is rotated clockwise by 1 degree. The white horizontal line slightly drops to the right.

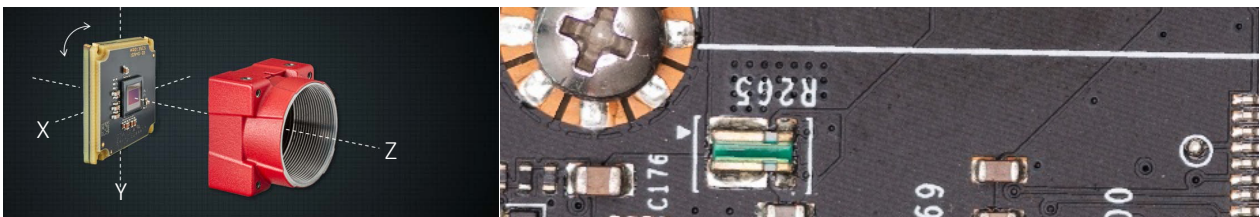


Figure 6: The sensor is twisted to the edge of the PCB (printed circuit board)

Shift along the X-Axis or Y-Axis

The image is shifted to the right by $200\ \mu\text{m}$ (~ 66 pixels). The screw head is cropped on the left.

Note: Depending on the lens, the sharpness can be different between the image corners. Potential vignetting is shifted out of center as well, which is harder to correct than typical vignetting that is centered.



Figure 7: The sensor is shifted along the X-Axis

Tolerances of bare board cameras



Downloads for 3D CAD files

You can download the corresponding 3D CAD file (STEP) for your Alvium bare board camera from www.alliedvision.com/en/support/alvium-step-file-toolbox. Please make sure you select the right camera model!

Figure 8 and Table 1 show the tolerances for the mounting area of Alvium bare board cameras. Adding sensor tolerances, it takes more than a good design to manufacture 100% quality output.

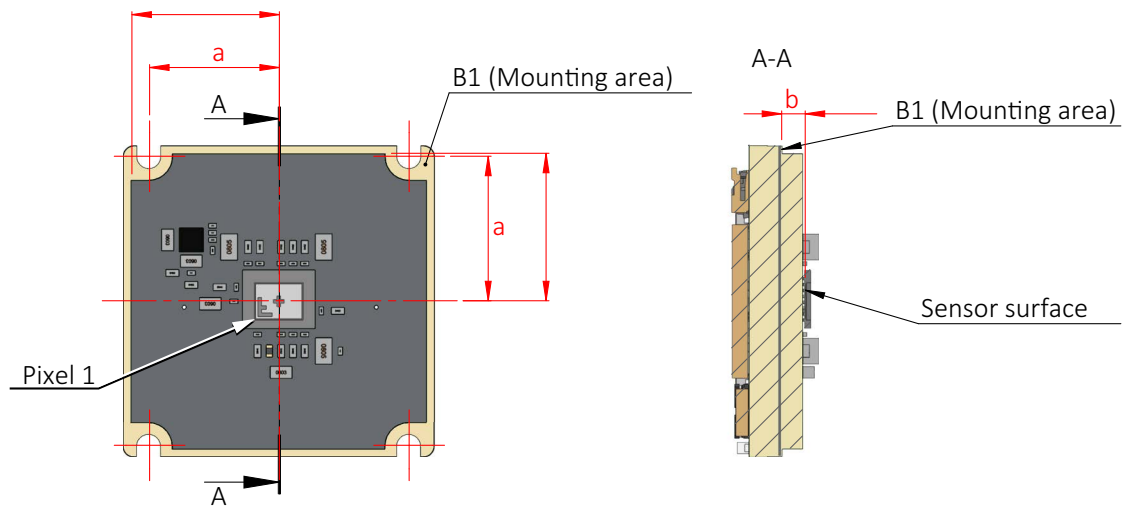


Figure 8: Bare board tolerances

Dimension	Tolerance
a	+/- 500 μm
b	+/-10%

Table 1: Bare board tolerances for draft design

Ask for our service!

We are aware that the tolerances listed above may not meet the accuracy requirements for your design-in. In case you need more accurate values for your mechanical design, we recommend you to consider [Alvium Frame: Solution out of the box](#) on page 1.

Otherwise, please ask us:

- Get most accurate tolerance values for **all axes**.
- Get tolerance values for the **Z-Axis by model**.
- Get tolerance values for **all axes by camera serial number**, from sample measurements out of the production. (This service is charged.)
- Have **your bare board camera integrated** at Allied Vision.

We know the difficulties of sensor alignment from building housed Alvium cameras in series production. Starting from first prototypes, we have reached excellent quality!

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