Allied Vision

Checklist

Mako to Alvium G1 Hardware Transition

V1.3.0
2024-Nov-04

Firmware

Mako G: Firmware loader 40118
Alvium G1: Firmware V00.14.00.baba1e3c

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

This document at a glance

Scope of this document

Our Sales and Support teams at Allied Vision and its partners want to make it easy for you to evaluate transitioning your application from Mako to Alvium G1. Therefore, this document compares data for Mako on the left to Alvium G1 on the right side of each page.

Additional notes explain differences in general and give valuable hints.

NOTICE

Damage to the camera and connected peripherals

Before you start to install and operate an Alvium G1 camera in an environment previously used with a Mako camera:

- Read the Alvium G1 Cameras User Guide.
- Observe the instructions and safety notes in the Alvium G1 Cameras User Guide.

What else do you need?

Documentation for Mako cameras

For the Mako manual, model data sheets, and application notes, see www.alliedvision.com/en/support/technical-documentation/mako-documentation.

For Alvium G1 camera documentation...

- Alvium G1 User Guide
- **Feature availability** between Mako G-507 and Alvium G1-507
- Additional documentation, such as feature descriptions
- Firmware downloads
- 3D CAD files (STEP)
- Accessories,

see www.alliedvision.com/en/support/technical-documentation/alvium-g1-documentation.

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Contents

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Document history

Version	Date	Document updates
V1.3.0	2024-Nov-04	**Firmware versions** Mako G: Firmware loader 40118 Alvium G1: Firmware V00.14.00.baba1e3c • Updated link location for Alvium G1 downloads. • Updated the firmware version for Alvium G1: Specifications in this document remain unchanged.
V1.2.4	2024-Aug-29	**Firmware versions** Mako G: Firmware loader 40118 Alvium G1: Firmware V00.13.01.794391f9 Added a note in the footer to **read the instructions and safety notes** in the Alvium G1 User Guide **before operating Alvium G1 cameras**.
V1.2.3	2024-Aug-19	**Firmware versions** Mako G: Firmware loader 40118 Alvium G1: Firmware V00.13.01.794391f9 • Updated data for firmware versions and loaders. • Updated values for frame rates and exposure times with Alvium G1 in Specifications for individual models on page 10. • Updated Sales addresses in Contact us on page 23. • Applied editorial changes.
V1.2.2	2023-Jul-13	Increased maximum operating temperature for Alvium G1 to +65 °C in Specifications common to all models on page 8.
V1.2.1	2023-Jun-08	**Firmware versions** Mako G-507: V01.54.40105 Alvium G1-507: V00.12.00.00611a22 • Updated the firmware version for Alvium G1. • Updated data in Specifications for individual models on page 10: - Reduced minimum operating temperature (housing) from +5 °C to -20 °C for G1. - Replaced drawing for Adapter plate Mako to Alvium G1. • Applied editorial changes.

Table 1: Document history (Sheet 1 of 2)

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Version	Date	Document updates
V1.2.0	2022-Nov-14	**Firmware versions** Mako G-507: V01.54.40105 Alvium G1-507: V00.11.00.9cf0c21e • Updated the title image. • Updated data in Specifications for individual models on page 10: - Added exposure time values for G1. - Updated exposure time values for Mako G. - Added data for G1-510 • Applied editorial changes.
V1.1.0	2022-Jul-18	**Firmware versions** Mako G-507: V01.54.21000 Alvium G1-507: V00.10.00.2cf3b22e • Updated data in Specifications for individual models on page 10: - Added Mako G-319 / Alvium G1-319 - Maximum Gain for G1 - Exposure time ranges for G1 - Power consumption for G1 - Maximum operating temperature for G1 • Applied minor editorial changes.
V1.0.0	2022-May-19	Initial version

Table 1: Document history (Sheet 2 of 2)

Document conventions

Typographical styles

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

Style	Function
Emphasis	Highlighting important things
`Feature names`	GigE features names are displayed as monospaced text.
Web addresses and references	Links to webpages and internal cross references

Table 2: Typographical styles

Symbols and notes

NOTICE

Material damage

Precautions are described.

Practical tip

Additional information helps to understand the information.

Additional information

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

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Specifications

Applied standards

Standard	Mako	Alvium G1
GigE Vision	Supported	
GenICam	Supported	
IP class	IP30 class (according to IEC 60529)	
Shock and vibration		
Random vibration testing	IEC 60068-2-64	IEC 60068-2-64 (higher stress level than Mako)
Shock testing	IEC 60068-2-27 (30g/6ms)	IEC 60068-2-27 (20g/11ms)
Bump testing	IEC 60068-2-27	Not applicable
Sinusoidal vibration testing	Not applicable	IEC 60068-2-6 (10-500Hz, 1.5mm/20g)
Lens load (non-static applications)	Lens < 140 grams, length < 38 mm, center of gravity = 20 mm	

Table 3: Applied standards | Mako versus Alvium G1

Specifications excluded from this comparison

Please see the corresponding camera manual for the following specifications:

- Curves for quantum efficiency and spectral response
- ROI frame rates and formulas for calculation (Mako only)
- Camera feature availability (See What else do you need? on page 2.)

Mako specifications not supported by Alvium G1

The following specifications stated for Mako cameras do not apply to Alvium G1 cameras:

- Decimation
- `StreamHoldCapacity`: This read-only firmware feature does not comply with the SFNC and is not supported by Alvium G1. Based on the image buffer size, you can calculate the number of images that can be stored on the camera for the corresponding pixel format and image resolution.
- Trigger related parameters: Trigger latency, Trigger jitter, Time between exposures

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Specifications common to all models

Feature	Mako: Specification	Alvium G1: Specification
Pixel formats[1]		
Monochrome pixel formats	Mono8, Mono12Packed, Mono12	Mono8, Mono10, Mono10p, Mono12, Mono12p
YUV color pixel formats	YUV411Packed, YUV422Packed, YUV444Packed	YCbCr411_8_CbYYCrYY, YCbCr422_8_CbYCrY, YCbCr8_CbYCr
RGB color pixel formats	RGB8Packed, BGR8Packed	BGR8, RGB8
RAW pixel formats	BayerRG8, BayerRG12, BayerRG12Packed	BayerRG8, BayerRG10, BayerRG10p, BayerRG12, BayerRG12p
Image buffer		
Image buffer (RAM)	64 MByte	32 MByte
Lens mount and filter		
Default lens mount	C-Mount	C-Mount, CS-Mount[2], S-Mount[2]
Default optical filter	• Monochrome and NIR models: No filter • Color models: Type Hoya C-5000 IR cut filter	• S-Mount models, monochrome and NIR models: No filter • Color models: Type Hoya C-5000 IR cut filter
I/Os and power requirements		
I/Os (opto-isolated)	1 input, 3 outputs	1 input, 1 output
GPIOs (non-isolated)	Not applicable	2 GPIOs[3]
Power requirements	10.8 to 26.4 VDC AUX or IEEE 802.3af	10.8 to 26.4 VDC AUX or IEEE 802.3af
Conditions for operation and storage		
Operating temperature	+5 °C to +45 °C (housing)	-20 °C to +65 °C (housing) | -20 °C to +85 °C (mainboard)
Storage temperature	-10°C to +70 °C (ambient, without condensation)	-20 °C to +85 °C (ambient)
Operating humidity	20% to 80% (non-condensing)	0% to 80% humidity (non-condensing)
Temperature monitoring	Mainboard	

[1] Only models with a sensor bit depth (ADC) of 12-bit support 12-bit pixel formats.

[2] Depending on the sensor size, these options are available on demand.

[3] To avoid damaging the camera, use with external power only, not with PoE.

Table 4: Common model specifications | Mako versus Alvium G1 (Sheet 1 of 2)

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Feature	Mako: Specification	Alvium G1: Specification
Camera dimensions (L × W × H)		
C-Mount	60.5 × 29.2 × 29.2 mm	41 × 29 × 29 mm
CS-Mount	On request	36 × 29 × 29 mm
S-Mount		36 × 29 × 29 mm
Mass (typical)		
C-Mount	80 g	65 g
CS-Mount	On request	
S-Mount		
Interface and camera control standard		
Interface standard	• IEEE 802.3 1000BASE-T (Gigabit Ethernet) and IEEE 802.3af (PoE) • GigE Vision Standard Version 1.2	
Camera control standard	GenICam SFNC Version 1.2.1	GenICam SFNC Version 2.7

[1] Only models with a sensor bit depth (ADC) of 12-bit support 12-bit pixel formats.

[2] Depending on the sensor size, these options are available on demand.

[3] **To avoid damaging the camera, use with external power only, not with PoE.**

Table 4: Common model specifications | Mako versus Alvium G1 (Sheet 2 of 2)

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Specifications for individual models

The following table compares Mako models with Alvium models using the same or a similar sensor.

Mako				Alvium G1			
Model	**Sensor**	**Feature**	**Specification**	**Model**	**Sensor**	**Feature**	**Specification**
040	Sony IMX287	Max. frame rate	286 fps	040	Sony IMX287	Max. frame rate	298 fps
		Exposure time range	16 µs to 85.89 s; 1 µs increments			Exposure time range	21 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.43 W at 12 VDC; 2.69 W PoE			Power consumption	3.1 W at 12 VDC; 3.4 W PoE
158	Sony IMX273	Max. frame rate	75 fps	158	Sony IMX273	Max. frame rate	74 fps
		Exposure time range	16 µs to 85.89 s; 1 µs increments			Exposure time range	27 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.43 W at 12 VDC; 2.68 W PoE			Power consumption	3.6 W at 12 VDC; 3.9 W PoE
234	Sony IMX249	Max. frame rate	41 fps	234	Sony IMX249	Max. frame rate	40 fps
		Exposure time range	16 µs to 85.89 s; 1 µs increments			Exposure time range	34 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.4 W at 12 VDC; 2.8 W PoE			Power consumption	3.0 W at 12 VDC; 3.3 W PoE
319	Sony IMX265	Max. frame rate	37 fps	319	Sony IMX265	Max. frame rate	37 fps
		Exposure time range	16 µs to 85.89 s; 1 µs increments			Exposure time range	31 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning[1]	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.5 W at 12 VDC; 2.7 W PoE			Power consumption	3.0 W at 12 VDC; 3.3 W PoE

[1] Color models: horizontal binning only

Table 5: Specifications for individual models (Sheet 1 of 2)

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Mako				Alvium G1			
Model	**Sensor**	**Feature**	**Specification**	**Model**	**Sensor**	**Feature**	**Specification**
507	Sony IMX264	Max. frame rate	23 fps	507	Sony IMX264	Max. frame rate	23 fps
		Exposure time range	16 µs to 85.89 s; 1 µs increments			Exposure time range	34 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning[1]	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.4 W at 12 VDC; 2.8 W PoE			Power consumption	3.1 W at 12 VDC; 3.4 W PoE
511	Sony IMX547	Max. frame rate	23 fps	510	Sony IMX548	Max. frame rate	23 fps
		Exposure time range	4 µs to 114.5 s; 1 µs incr.			Exposure time range	23 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning[1]	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.7 W at 12 VDC; 3.2 W PoE			Power consumption	3.2 W at 12 VDC; 3.6 W PoE
811	Sony IMX546	Max. frame rate	14 fps	811	Sony IMX546	Max. frame rate	14 fps
		Exposure time range	4 µs to 114.5 s; 1 µs incr.			Exposure time range	26 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning[1]	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.8 W at 12 VDC; 3.3 W PoE			Power consumption	3.7 W at 12 VDC; 4.0 W PoE
1242	Sony IMX264	Max. frame rate	9.6 fps	1242	Sony IMX264	Max. frame rate	9.5 fps
		Exposure time range	4 µs to 114.5 s; 1 µs incr.			Exposure time range	37 µs to 10 s
		Gain	0 to 40 dB; 0.1 dB increments			Gain	0 to 48 dB; 0.1 dB increment
		Binning[1]	H: 1 to 4 pixels; V: 1 to 4 rows			Binning	H: 1 to 8 pixels; V: 1 to 8 rows
		Power consumption	2.9 W at 12 VDC; 3.3 W PoE			Power consumption	3.8 W at 12 VDC; 4.0W PoE

[1] Color models: horizontal binning only | [2] Coming soon

Table 5: Specifications for individual models (Sheet 2 of 2)

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Technical drawings - cameras

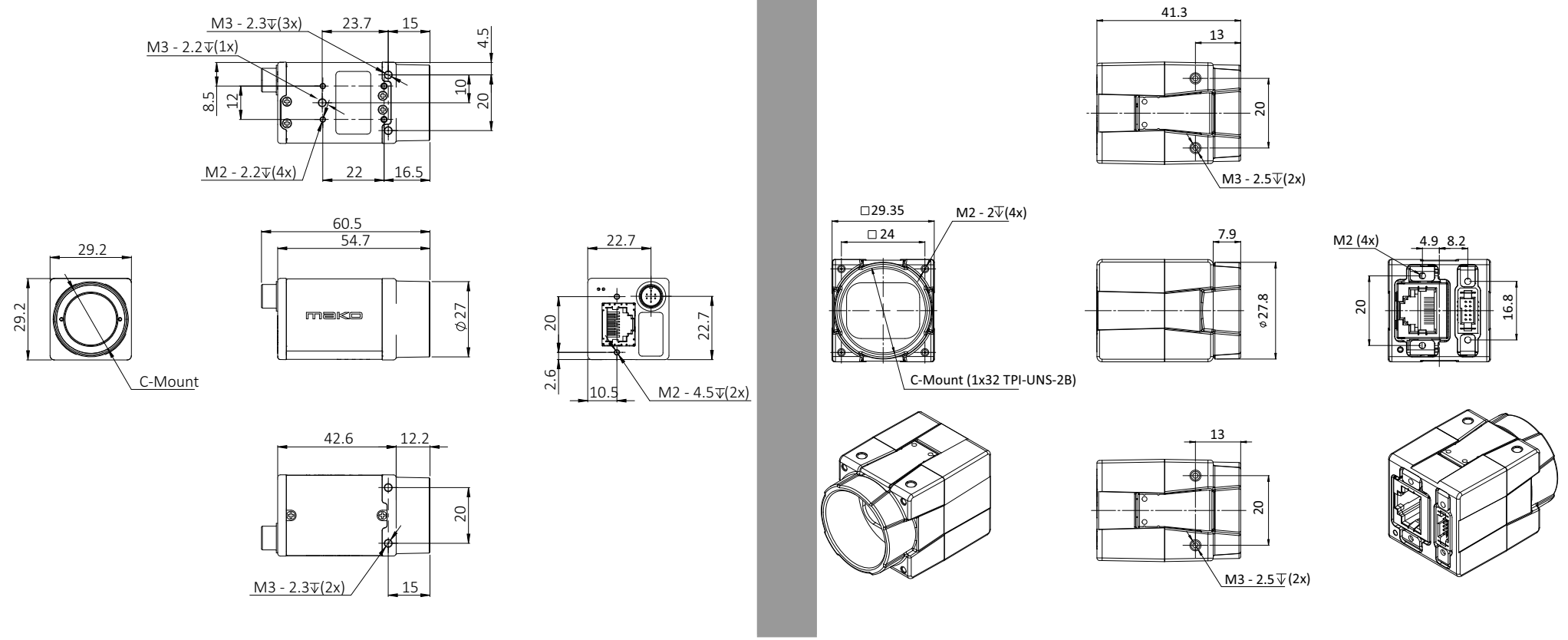


Figure 1: Technical drawings | Mako versus Alvium G1

Reusing mounting holes for Mako with Alvium G1 cameras

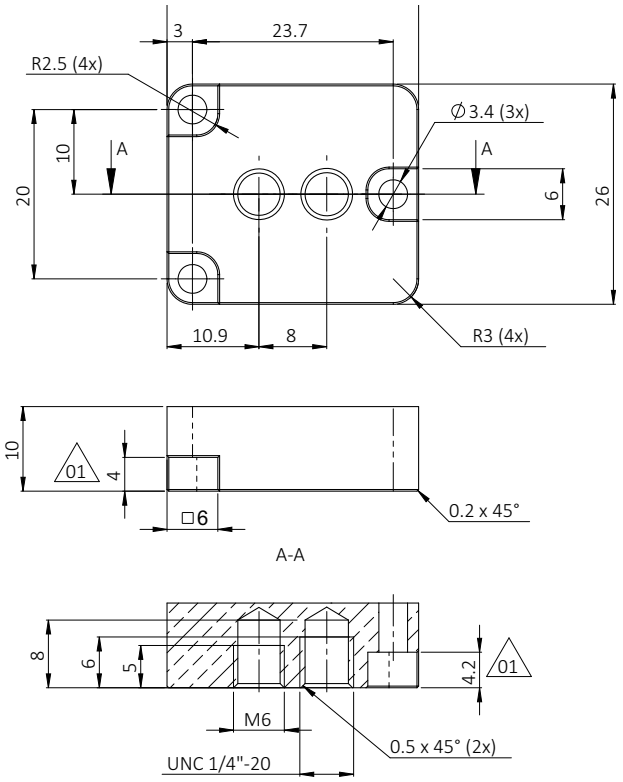
Depending on the mounting options you currently use, you might be able to mount an Alvium G1 camera using the existing mounting holes. In some cases it may be necessary to use one of the adapter plates shown in Technical drawings- mounting adapters on page 13.

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

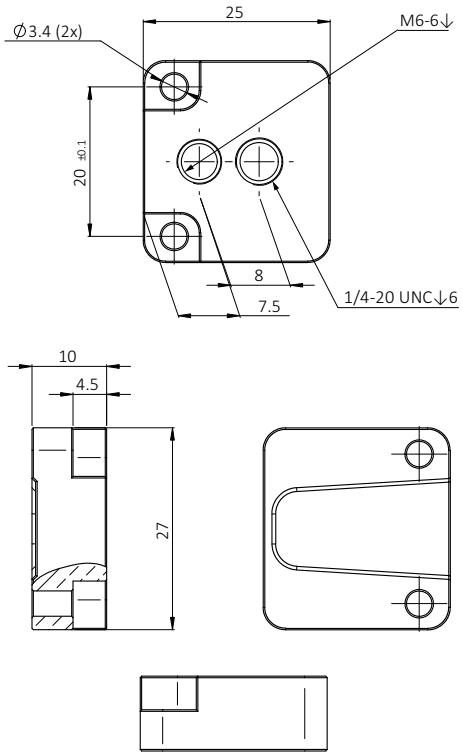
Technical drawings - mounting adapters

The Alvium G1 mounting adapter provides the bottom mounting holes of Mako camera to make the replacement easy.

Mako tripod adapter



Alvium G1 tripod adapter



Adapter plate Mako to Alvium G1

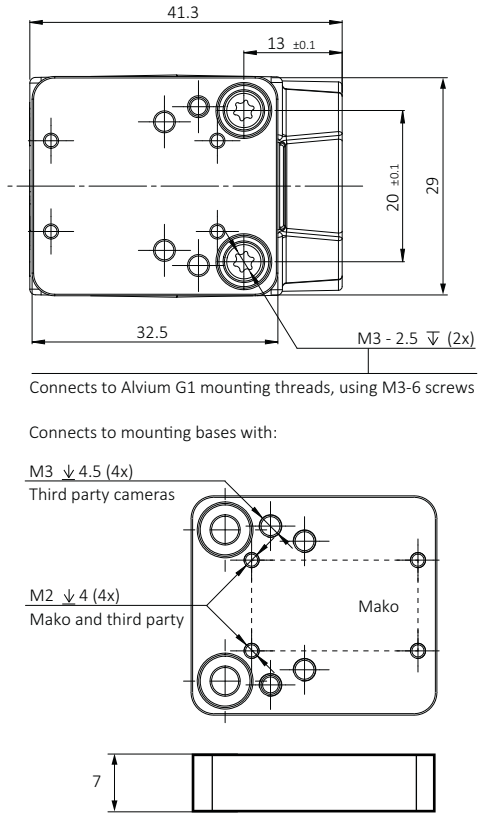


Figure 2: Technical drawings mounting adapters | Mako versus Alvium G1

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Lens mounts and maximum protrusion

The maximum protrusion for Alvium G1 is greater than for Mako. Typically, lenses can be reused.

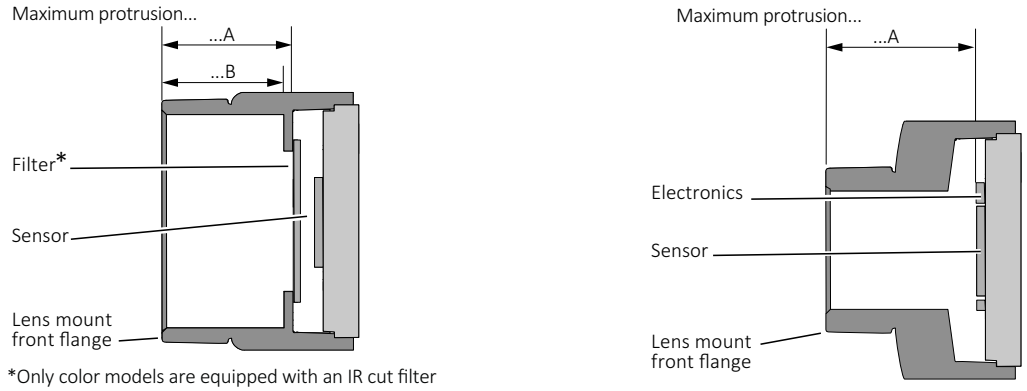


Figure 3: Maximum protrusion parameters — C-Mount and CS-Mount (left); S-Mount (right)

Figure 3 shows schematics for maximum protrusion of lenses, Table 6 shows values for maximum protrusion.

NOTICE

Damage to the lens and filter

If you install an individual screw-in filter in your Alvium G1 camera, the value for maximum protrusion is reduced.

	Mako				Alvium G1		
Mount	**Filter diameter**	**Max. protrusion A**	**Max. protrusion B**		**Filter diameter**	**Max. protrusion A**	**Max. protrusion B**
C-Mount	16 mm	10.2 mm	9.2 mm		Does not affect maximum protrusion.	Greater than for Mako	13.6 mm
	22 mm	11.0 mm	8.2 mm				
CS-Mount	16 mm	5.2 mm	4.2 mm				8.6 mm
	22 mm	6.0 mm	3.2 mm				
S-Mount	16 mm	Contact Allied Vision Support.				11.0 mm	Not applicable
	22 mm						

Table 6: Maximum protrusion values | Mako versus Alvium G1

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Optical filters

Mako and Alvium G1 color cameras (except for Alvium G1 S-Mount) are equipped with the same type of IR cut filter. The Modular Concept offers additional filter options for Mako. Please ask Allied Vision Support for options with Alvium G1.

	Mako: Filter availability				Alvium G1: Filter availability		
Color or monochrome model	**C-Mount**	**CS-Mount**	**S-Mount**		**C-Mount**	**CS-Mount**	**S-Mount**
Color	Type Hoya C5000 IR cut filter		Contact Allied Vision Support.		Type Hoya C5000 IR cut filter		No filter
Monochrome	No filter				No filter		

Table 7: Optical filter availability | Mako versus Alvium G1

The following plot shows the filter transmission response for the type C-5000 IR cut filter. Values may vary slightly by filter lot.

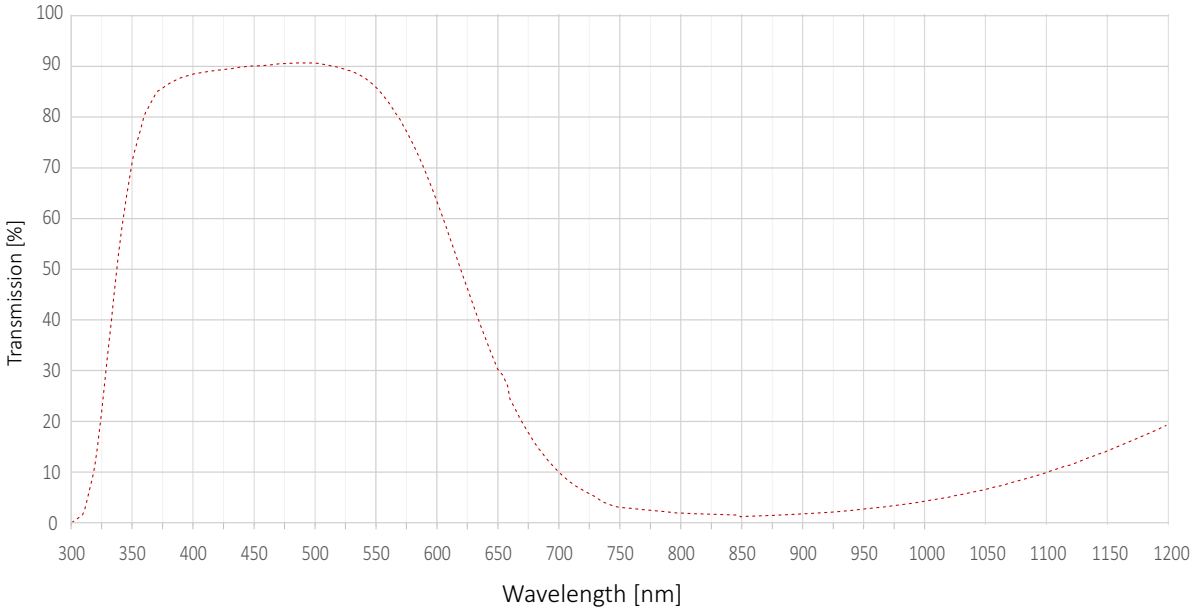


Figure 4: Optical filter spectral transmission (exemplary curve) | Common for Mako and Alvium G1

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Camera interfaces

Back panel and LEDs

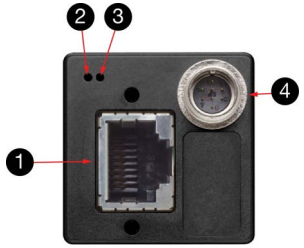
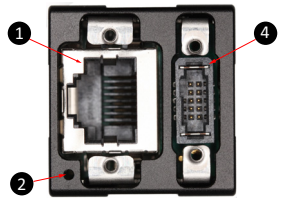
Mako	Alvium G1
	

Figure 5: Back panel overview | Mako versus Alvium G1

Legend

Number	Mako	Alvium G1
1	Gigabit Ethernet port	
2	LED 1 (orange)	Multi-color LED (green, yellow, red)
3	LED 2 (green)	Not applicable
4	Hirose I/O port	TFM I/O port

Table 8: Back panel elements legend | Mako versus Alvium G1

Status	Mako LEDs	Alvium G1 LEDs
Camera powered	Solid green	Not applicable
Booting routine	Slow flashing green	Not applicable
Camera initializing	Not applicable	Solid yellow
Ethernet link established	Solid orange	Slow flashing green
Network traffic	Flashing orange	Not applicable
Transmission error	Four rapid green flashes per second	Solid red

Table 9: LED status codes | Mako versus Alvium G1

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

I/O connector pin assignment

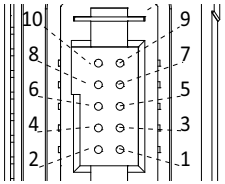
Mako: Hirose HR25-7TR-8PA(73)							Alvium G1: TFM-105-02-L-D-WT-K-TR					
												
Pin	**Signal**	**<>**	**Level**	**Description**	**I/O cable color code**		**Pin**	**Signal**	**<>**	**Level**	**Description**	**I/O cable color code**
1	Out 1	Out	Open emitter, max. 20 mA	Opto-isolated output	Yellow dot Red	✓	6	GPO2	Out	Open emitter, max. 20 mA	See Mako	Green
2	Out 2	Out	Open emitter, max. 20 mA	Opto-isolated output	Yellow dot Black	—	Not applicable					
3	Out 3	Out	Open emitter, max. 20 mA	Opto-isolated output	Gray dot Red	—	Not applicable					
4	In 1	In	U_{in}(high) = 3.0 to 24.0 V up to 36 VDC with 3.3 kΩ ext. resistor in series U_{in}(low) = 0 to 1.0 V	Opto-isolated input	Gray dot Black	✓	5	GPI3	In	U_{in}(high) = 3.0 to 24.0 V up to 36 VDC with 3.3 kΩ ext. resistor in series U_{in}(low) = 0 to 1.0 V	See Mako	Yellow
Not applicable						—	7	GPIO0	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. 20 mA	Non-isolated I/O (LVTTL)	Blue
Not applicable						—	8	GPIO1	In/Out			Violet
5	Isolated In GND	In	0 VDC	Isolated input signal ground	Pink dot Black	✓	3	OPTO-IN-GND	In	See Mako	See Mako	Brown
6	Isolated Out Power	In	max. 30 VDC	Power input for opto-isolated outputs	Pink dot Red	✓	4	OPTO-OUT-PWR	In	max. 30 VDC	See Mako	Orange
7	Camera Power	In	12 to 24 VDC ±10%	Camera power supply	Orange dot Black	✓	2	PWR-IN	In	See Mako	See Mako	Red
8	Camera GND	In	0 VDC	Ground for camera power supply	Orange dot Red	✓	1	PWR-GND	In	See Mako	See Mako	Black
Not applicable						—	9	Reserved				Gray
*	C-GND	Power	0 VDC	Chassis ground and shielding	Transparent	✓	10	C-GND	Power	0 VDC	Chassis ground and shielding	Transparent
* Connector metal shell (Hirose term)												

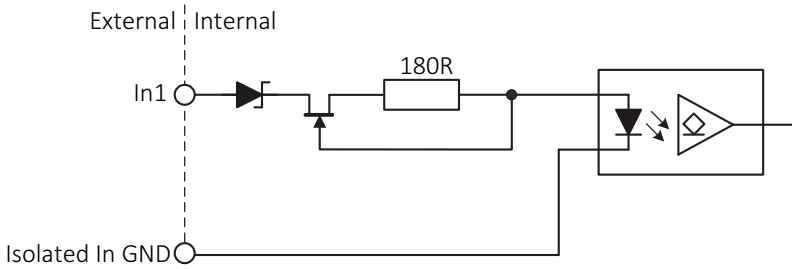
Table 10: I/O connector pin assignment | Mako versus Alvium G1

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Opto-isolated input description

For Alvium G1's non-isolated GPIOs, see Alvium G1: Non-isolated GPIOs description on page 21.

Mako: Opto-isolated input block diagram



Alvium G1: Opto-isolated input block diagram

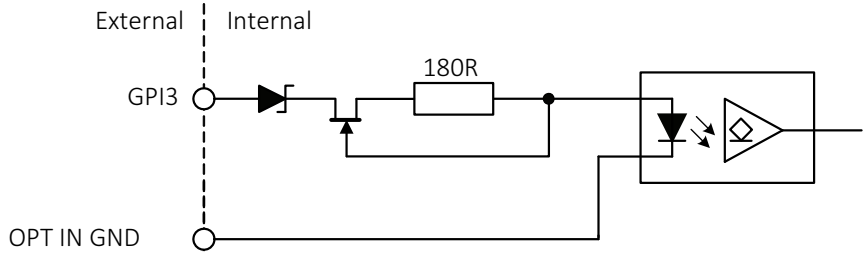


Figure 6: Opto-isolated input block diagram | Mako versus Alvium G1

Parameter	Mako = Alvium G1: Opto-isolated input levels
U_{in} (low)	0 to 1.0 V
U_{in} (high)	3 to 24 V
Current (constant-current source)	3 to 4 mA

Table 11: Opto-isolated iput levels | Common for Mako and Alvium G1

Mako = Alvium G1: Minimum pulse width

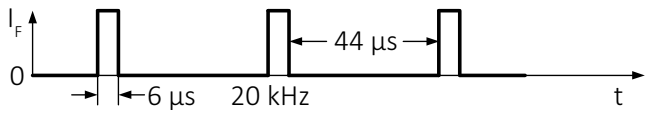


Figure 7: Minimum pulse width | Common for Mako and Alvium G1

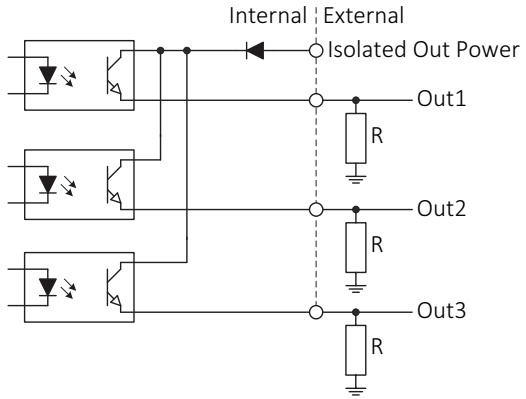
Common test conditions for Mako and Alvium G1: The input signal was driven with 3.3 V and no external additional series resistor.

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Opto-isolated output description

For Alvium G1's non-isolated GPIOs, see Alvium G1: Non-isolated GPIOs description on page 21.

Mako: Opto-isolated output block diagram



Alvium G1: Opto-isolated output block diagram

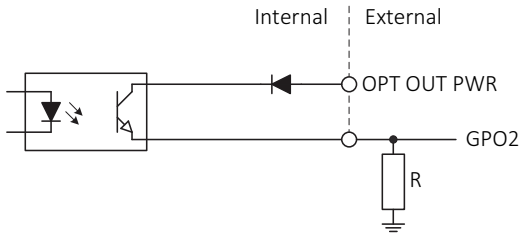


Figure 8: Opto-isolated output block diagram | Mako versus Alvium G1

Opto-isolated output levels

Mako = Alvium G1: Opto-isolated output levels
5 V at 1.0 kΩ
12 V at 2.4 kΩ
24 V at 4.7kΩ
At ~ 5 mA minimum required current draw. **Mako**: A resistor is required if **Out1**, **Out2**, **Out3** connected to a device with < 5 mA draw, that is, high impedance. Alvium G1: A resistor is required if **GPO2** connected to a device with < 5 mA draw, that is, high impedance.

Table 12: Opto-isolated output levels | Common for Mako and Alvium G1

Opto-isolated output switching times

The opto-isolated output switching times are **common for Mako and Alvium G1**.

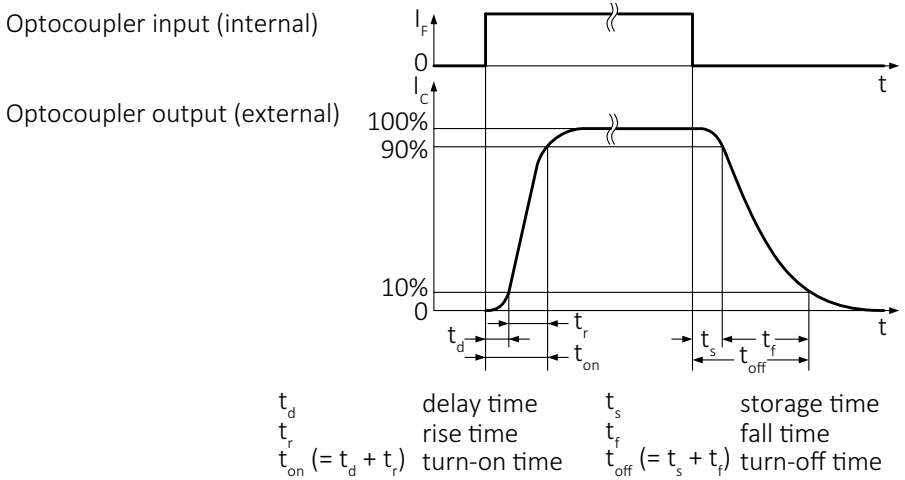


Figure 9: Opto-isolated output switching times parameters

Mako = Alvium G1: Parameter and value	
$t_d \approx 1$ µs	$t_s \approx 26$ µs
$t_r \approx 1$ µs	$t_f \approx 21$ µs
$t_{on} = t_d + t_r \approx 2$ µs	$t_{off} = t_s + t_f \approx 47$ µs (t_{off} can deviate by ± 5 µs)

Table 13: Parameter values | Common for Mako and Alvium G1

Test conditions for the output: external 2.4 kΩ resistor to ground, Isolated Out Power set to 12 Volts.

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

Alvium G1: Non-isolated GPIOs description

The camera has two non-isolated GPIOs that can be configured by software to act as inputs or outputs.

Alvium G1 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 G1 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 10. The push-pull GPIOs are able to source or sink current from an external pin.

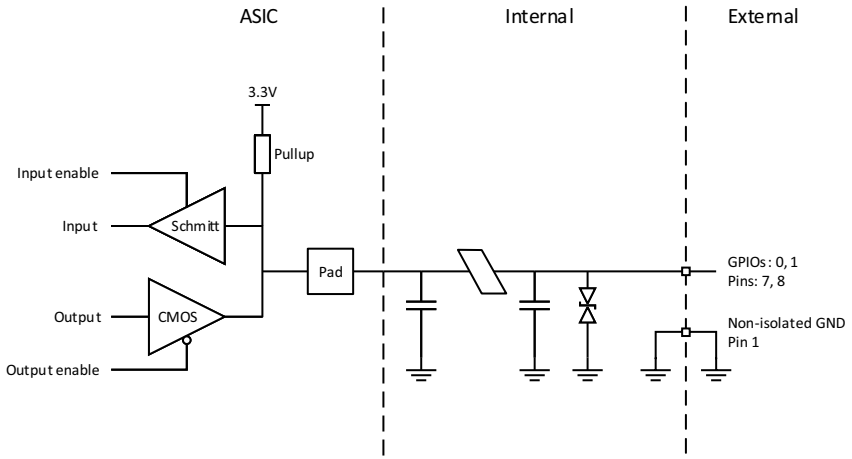


Figure 10: Non-isolated GPIOs block diagram | Alvium G1

Non-isolated 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 the maximum input voltage can damage the camera.

Keep maximum input voltage below 5.5 VDC.

Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.

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 14: Non-isolated GPIOs as input, voltage levels | Alvium G1

Non-isolated output levels

NOTICE

Damage to the camera by high output current

The camera can be damaged when connected to a device that exceeds the specified maximum current or voltage. Keep the maximum current below 12 mA per output.

Parameter	Value
External output voltage U_{out} (low, Off state)	0 to 0.4 VDC
External output voltage U_{out} (high, On state)	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 15: GPIOs as output, current and voltage levels | Alvium G1

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.

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Avoid camera damage! Before operating Alvium G1 cameras, read the instructions and the chapter Product Safety in the Alvium G1 User Guide.