



## ALVIUM MIPI CSI-2 CAMERAS AND ACCESSORIES

# MIPI CSI-2 Cables

# User Guide

V1.0.1

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# Read before use

## EN - English

### Safety

Before using the product, read these safety instructions. Observe the warnings at all times. Use the product only as stated in the [Intended use](#) on page 15.

### 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.

## DA - Dansk

### Sikkerhed

Læs sikkerhedsanvisningerne, før produkt bruges. Overhold alle advarsler. Brug kun produkt som anført i [Intended use](#) på side 15.

### Tilsigtet brug

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

## DE - Deutsch

### Sicherheit

Bevor Sie das Produkt benutzen, lesen Sie diese Sicherheitshinweise. Beachten Sie diese Hinweise immer. Verwenden Sie das Produkt nur wie beschrieben in [Intended use](#) auf Seite 15.

### Bestimmungsgemäßer Gebrauch

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

## ES - Español

### Seguridad

Antes de utilizar el producto lea estas instrucciones de seguridad. Observe las advertencias en todo momento. Utilice el producto solo tal y como se estipula en el [Intended use](#) en la página 15.

### 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.

## FI - Suomi

### Turvallisuus

Lue nämä turvallisuusohjeet ennen tuotteen käyttöä. Noudata tuotetta joka hetki. Käytä tuotteen ainoastaan kohdassa [Intended use](#) sivulla 15 kuvatulla tavalla.

### Käyttötarkoitus

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

## FR - Français

### Sécurité

Veuillez lire ces consignes de sécurité avant d'utiliser le produit. Respectez continuellement les avertissements. Utilisez le produit uniquement comme indiqué sous [Intended use](#), page 15.

### 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.

## HE - עברית

### בטיחות

לפני השימוש במוצר, עליך לקרוא את הוראות הביטחון האלו. עליך לממש הוראות ביטחון אלו תמיד. השימוש במצלמה הוא רק לפי מה שכתוב ב"כוונת השימוש" ([Intended use](#) בעמוד 15).

### שימוש מיועד

מוצרי AlliedVision מיועדים לשילוב במערכות ממוחשבת לעיבוד צילומים ע"י אנשי מקצוע. כל מוצרי AlliedVision נמכרים לשימוש בסביבת B2B.

## IT - Italiano

### Sicurezza

Leggere queste istruzioni per la sicurezza prima di utilizzare il prodotto. Osservare sempre tutte le avvertenze. Utilizzare il prodotto come descritto alla sezione [Intended use](#) a pagina 15.

### 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.

## JA - 日本語

### 安全性

本製品を使用する前に、この安全ガイドをお読みください。警告を必ず守ってください。必ず21ページのIntended use 15 ページに従って使用してください。

### 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。

## NL - Nederlands

### Veiligheid

Lees deze veiligheidsinstructies voordat u het product gebruikt. Neem deze waarschuwingen altijd in acht. Gebruik het product uitsluitend, zoals aangegeven in het [Intended use](#) op pagina 15.

### 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.

## NO - Norsk

### Sikkerhet

Les disse sikkerhetsinstruksene før du bruker produkt. Følg advarslene til en hver tid. Bruk kun produkt i samsvar med [Intended use](#) på side 15.

### 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.

## SV - Svenska

### Säkerhet

Läs igenom säkerhetsinstruktionerna innan du använder produkten. Var hela tiden särskilt uppmärksam på varningarna. Använd enbart produkten på det sätt som anges i [Intended use](#) på sida 15.

### Avsedd användning

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

## ZH - 简体中文版

### 安全需知

在使用产品之前，请阅读这些安全说明。请务必遵守相关警告 和 [Intended use](#) 于第 15 页。

### 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。

# This document at a glance



Get an overview of documentation for MIPI CSI-2 cables:

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## Note



### Read this document carefully

Learn to use MIPI CSI-2 cables in the most safe and efficient way and avoid damage to your embedded system.

## Supported products

MIPI CSI-2 cables in this user guide can be used to connect:

- Alvium CSI-2 cameras
- Alvium FP3/GM2 Coax cameras
- Adapter boards (for Alvium CSI-2 cameras)
- Deserializer boards (for Alvium FP3/GM2 Coax cameras)
- Compatible embedded boards

## What else do you need?

This is a selection of helpful downloads:

Download	Link
<b>Camera documentation</b> for installation and operation: <ul style="list-style-type: none"> <li>• Alvium FP3/GM2 Coax User Guide</li> <li>• Alvium CSI-2 Cameras User Guide</li> </ul>	<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>
<b>Accessories</b> , such as adapter boards, deserializer boards, FAKRA coaxial cables, I/O cables, lenses, and tripod adapters	<a href="http://www.alliedvision.com/en/products/accessories">www.alliedvision.com/en/products/accessories</a>
<b>SerDes Configurator:</b> Please contact the Allied Vision Support team at...	<a href="http://www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma">www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma</a>

Table 1: Downloads for MIPI CSI-2 FPC cables



# 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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# Document history and conventions



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## Document history

Version	Date	Remarks
V1.0.1	2024-Mar-15	Added UKCA symbol in <a href="#">Compliance notifications</a> on page 15.
V1.0.0	2023-Apr-19	Release version

Table 2: Document history

## Conventions used in this user guide

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

### Typographical styles

Style	Function
<b>Emphasis</b>	Highlighting important things
<a href="#">Web links and references</a>	Links to webpages and internal cross references

Table 3: Typographical styles

### Symbols and notes



#### **NOTICE**

##### **Material damage**

Precautions are described.



##### **Practical tip**

Additional information helps to understand or ease handling the camera and components.



##### **Additional information**

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

## Component naming

Components described in this user guide are not defined by common standards. Therefore, naming must be accurate to avoid misconceptions. Simplified terms are used in this document to avoid lengthy naming.

Short version used in this document	Long version
Adapter board	Example: Adapter Board for NVIDIA Jetson Nano and Jetson Xavier NX DevKit (adapts Alvim CSI-2 cameras and deserializer boards to NVIDIA Jetson Nano and Jetson Xavier NX DevKit)
Deserializer board	Example: Deserializer Board FPD-Link III Coax to CSI-2
Embedded board	Example: NVIDIA Jetson Xavier NX DevKit
FPC connector	Hirose FH55-22S-0.55SH FPC (flexible printed circuit) connector
FPC cable	MIPI CSI-2 FPC (flexible printed circuit) cable

*Table 4: Component naming*

# Compliance, safety, and intended use



This chapter includes:

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## Compliance notifications



National regulations on disposal must be followed.

## 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

All text, pictures, and graphics are protected by copyright and other laws protecting intellectual property. All content is subject to change without notice.

All trademarks, logos, and brands cited in this document are property and/or copyright material of their respective owners. Use of these trademarks, logos, and brands does not imply endorsement.

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## Product safety

To prevent material damage, read the following to understand risks in using MIPI CSI-2 FPC cables.

### Electrical connections

FPD-Link III, GMSL2, and MIPI CSI-2 do not specify electrical connections as extensively as the USB or GigE standard. Plug and play is not supported. Read specifications carefully.

Components can easily be damaged. If you are unfamiliar with these interface connections or with embedded systems, be extremely careful. Follow the instructions in the corresponding user guides.

Allied Vision accessories help to avoid damage to the camera and connected components.



#### Compatible accessories

We recommend using accessories by Allied Vision, see [www.alliedvision.com/en/products/accessories](http://www.alliedvision.com/en/products/accessories).

### Strain relief for all cable connections

Hirose FH55 FPC connectors can be damaged easily.

Provide sufficient strain relief for all cable connections to avoid malfunctions and damage to electronics by wrong polarity and short circuits. To protect cameras and connected components, secure cables as shown in [Figure 1](#).

Dimensions for strain relief with FPC cables apply to connections between Alvimium CSI-2 cameras and adapter boards as well.

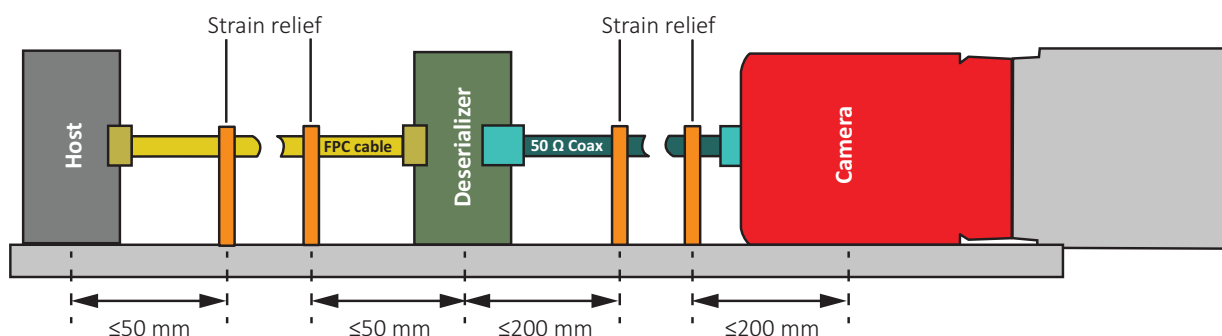


Figure 1: Strain relief for all cable connections



## Damage to cameras and peripherals

If MIPI CSI-2 FPC cables are used with Alvim Flex cameras and components, these cameras and components, and the connected peripherals can be damaged.

Use MIPI CSI-2 FPC cables only to connect devices with matching connector, including suitable pinning, and signal levels for:

- Standard Alvim CSI-2 cameras to adapter boards or to embedded boards
- Deserializer boards to embedded boards.

## No hot-plugging

Connections for FPD-Link III, GMSL2, and MIPI CSI-2 do not support hot-plugging. Hot-plugging can destroy the camera and connected hardware by high inrush current.

Disconnect power supplies before connecting or disconnecting devices from each other.

## Signal quality

Noise and electromagnetic interference can disable camera functions.

- Avoid squeezing cables and bending cables over edges.
- Avoid contact to metal surfaces, causing electromagnetic interference.
- Please use cables recommended by Allied Vision.

## FPC connectors

Small-sized Hirose FH55-22S-0.55SH FPC connectors enable compact board design. Therefore, they are sensitive to mechanical stress. Especially if you are inexperienced with these, be very cautious. If FPC connectors are broken, the complete device must be replaced. Follow the instructions in [Connecting FPC cables](#) on page 31 carefully.

- Avoid stress to FPC connectors.
- Allow only the FPC cable to touch conductors.

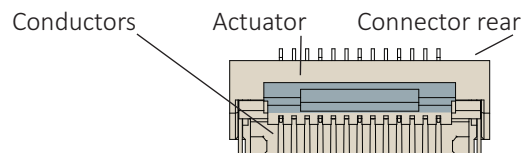


Figure 2: Hirose FH55-22S-0.55SH FPC connector

## Mating and unmating cycles

FPC connectors are designed for one-time installation, with the opportunity for corrections. Therefore, these connectors are specified for **maximum 20** mating and unmating cycles.

### Handling the actuator

- Move the actuator only as described in the instructions.
- Carefully flip the actuator at the middle with your finger nail as described in the instructions.
- Follow the instructions in [Using MIPI CSI-2 FPC cables](#) on page 22.



### Additional information

For technical data and more instructions on Hirose connectors, see [www.hirose.com](http://www.hirose.com).

## FPC cables

### FPC cable position and orientation

Short circuits of FPC cables can damage the camera or connected hardware. Insert FPC cables into FPC connectors with cable guiding tabs matching the connector's side guides. See [Using MIPI CSI-2 FPC cables](#) on page 22.

### FPC cables and stress

Over-stressed FPC cables can damage the camera and connected hardware. When connected devices are twisted against each other or pulled apart from each other with too much force, the FPC cable is over-stressed. Spring contacts of FPC connectors are worn out, causing short circuits and unreliable electrical connections.

- Allow only slight bending of the FPC cable (minimum bending radius: 10 mm).
- For strain relief, see [Strain relief for all cable connections](#) on page 16.

## 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.
- You may mount the camera electrically isolated.
- 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-csi-2-documentation](http://www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation).

# Specifications



This chapter includes:

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## Specifications overview

Feature	Specification
Product codes and cable length	18947: 70 mm ±0.1 mm 12316: 120 mm ±0.1 mm 12317: 220 mm ±0.1 mm 12318: 420 mm ±0.1 mm
Cable width × thickness	11.5 mm ±0.1 mm × ~0.2 mm
Connector thickness	0.3 mm ±0.03 mm
Classification	Industrial grade for static applications
Static bending radius (min.)	10.0 mm
Dynamic bending radius (min.)	For static applications only
Bending cycles (max.)	300
Differential impedance $Z_{Diff}$	100 Ω
Number of connectors	22
Connector pitch	0.5 mm
Compatible connector	Hirose FH55-22S-0.5SH
Supported devices	Alvium CSI-2 cameras, Allied Vision embedded board adapters, Allied Vision deserializer boards, compatible embedded boards
Operating temperature range	+5 °C to +65 °C

Table 5: MIPI CSI-2 FPC cables specifications overview



### Hirose FH55 connectors

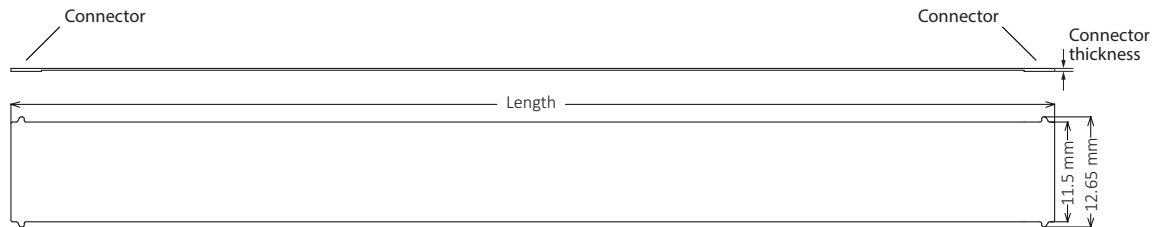
For technical data and more instructions on Hirose FH55-22S-0.5SH connectors, see [www.hirose.com](http://www.hirose.com).



### Designing your own embedded components

If you want to design your own components to connect Alvium CSI-2 cameras to embedded boards, contact your Allied Vision Sales representative or Allied Vision 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).

## Technical drawing



## Connection direction



The arrow print indicates the direction between connected devices to prevent short circuits by reverse polarity, destroying cameras or peripherals:

Digital interface	Arrow print	
	Host	Camera
MIPI CSI-2	Adapter board or embedded board	Alvium CSI-2 camera
FPD Link III, GMSL2	Embedded board	Deserializer board

Table 6: Arrow print and corresponding devices

# Using MIPI CSI-2 FPC cables



This chapter includes basic instructions for connecting MIPI CSI-2 FPC cables:

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## Precautions



### NOTICE

#### Damage to cameras and peripherals

If MIPI CSI-2 FPC cables are used with Alvim Flex cameras and components, these cameras and components, and the connected peripherals can be damaged.

Use MIPI CSI-2 FPC cables only to connect devices with matching connector, including suitable pinning, and signal levels for:

- Standard Alvim CSI-2 cameras to adapter boards or to embedded boards
- Deserializer boards to embedded boards.

## Connecting FPC cables

Figure 3 shows how the FPC cable connects to the FPC connector.

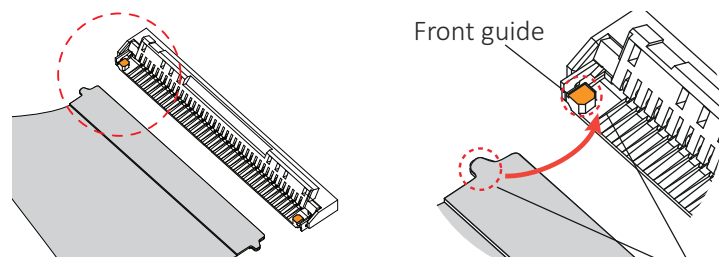


Figure 3: FPC cable and FPC connector (open position)

1. Opening the FPC connector:  
With your fingernail\*, flip the actuator to open position at 105° to the PCB surface, see Figure 4.

\*Or use a plastic tool, as metal tools can damage the actuator.

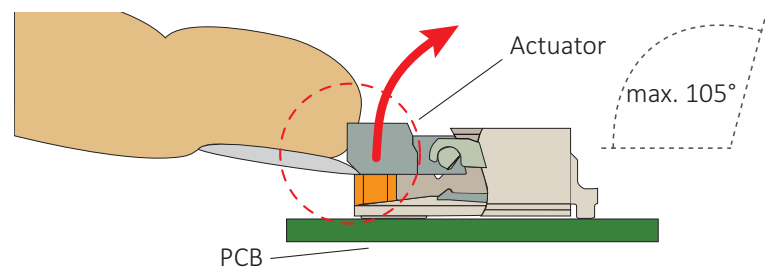


Figure 4: Opening the FPC connector


**NOTICE**
**Damage to cameras or deserializer boards by reverse polarity**

If Alvium cameras or peripherals are powered with reverse polarity, electronics is damaged.

- Before connecting power, see the user guides of the corresponding devices.
- Connect the cable as shown in this section.

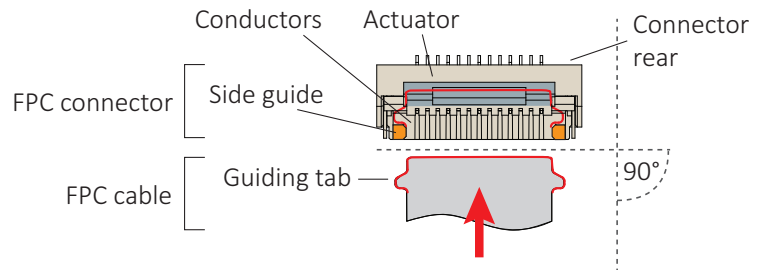
 Adapter board or  
embedded board

 Camera or  
deserializer board

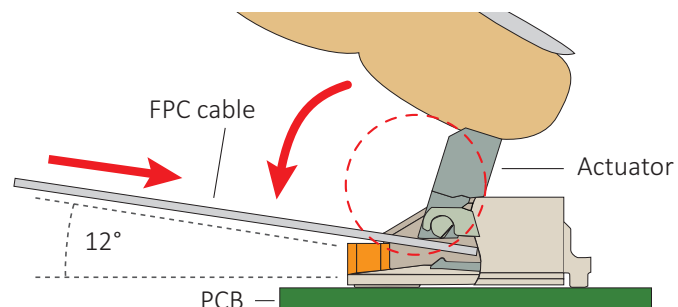
*Figure 5: FPC cable and data flow direction*

2. **Ensuring proper cable orientation between devices to be connected**, take the FPC cable with conductors facing the FPC connector conductors (see [Figure 6](#) on page 24).

3. Inserting the FPC cable:  
At a horizontal angle of  $90^\circ$  to the connector's rear (see [Figure 6](#)) and at a vertical angle of  $12^\circ$  to the PCB (see [Figure 7](#)), slowly insert the FPC cable into the actuator...


*Figure 6: FPC cable and FPC connector*

4. ...until cable guiding tabs are caught between connector rear and side guides (see [Figure 6](#)). Pull the cable slightly to ensure guiding tabs are properly engaged.


*Figure 7: Engaging the FPC cable in the FPC connector*

5. Holding the FPC cable in position, flap down the actuator to closed position (see [Figure 7](#)).