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PROTON CAMERA INNOVATIONS

PROTON 4K Mini Broadcast Camera

PROTON CAM

Welcome

- Dear content creator, thank you for choosing our PROTON CAM for your next project.
- PROTON CAM is the smallest broadcast camera in the market with full image control, amazing 12 bit dynamic and ultra wide- angle shots,
- This will give you spectacular new perspectives without compromising on quality.
- The only limit is your imagination.
- This Operational Manual gives you a short overview of how to operate the camera. Detailed information about the control interface can be found in the Reference Manual.
- In case you are missing a feature in on our product, feel free to share your thoughts with us. We love to get your feedback to bring even more innovation into our products.
- Your PROTON CAMERA INNOVATIONS Team.
- FUTURE. MINI. CAMERA.

Technical data

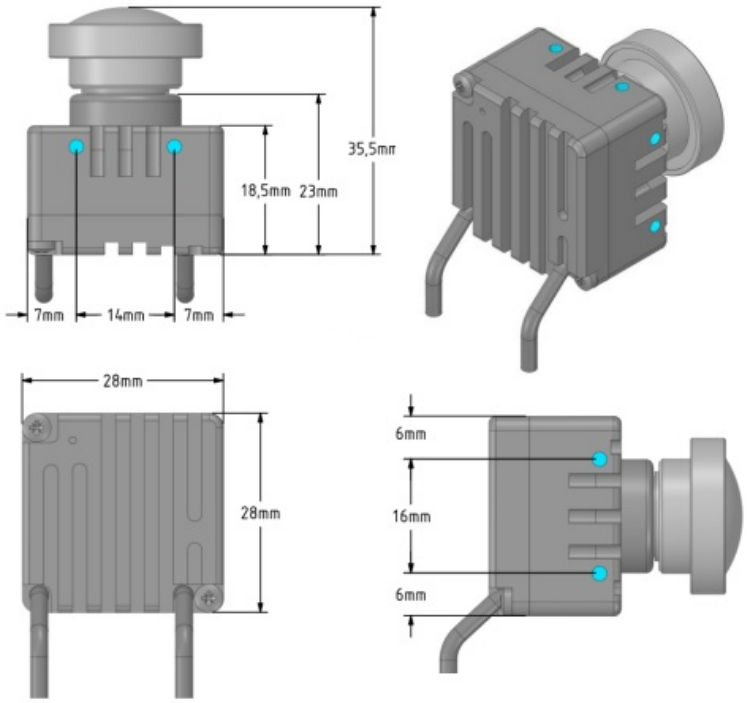
Overview

Specification	Details
Size	28 × 28 × 23 mm
Weight	24.5 g (body only) 5.5 g (lens 3.2 mm / 97°) 57 g (cable; ~30 g/m)

Specification	Details
Operating Voltage	4.5 V – 25 V (Reverse polarity protected)
Power Consumption	2.5 W (at 1080P60, cold camera)
Operating Temperature	-30°C to 75°C
Lens Mount	M12 / S-mount
IR Filter	Built-in high-quality IR cut filter Supports lenses without IR filter with accurate color reproduction
Sensor	4 µm pixel size 1/1.8″ format 8.8 mm diagonal 12-bit dynamic range (72 dB)
Field of View (FOV)	124° H / 85° V (with 2.2 mm lens) 97° H / 64° V (with 3.2 mm lens)
ISO Range	75 – 2400 200 – 6400 (in low light mode)
Shutter Speed	6 µs to 1/FPS
Video Modes	1920×1080 SDI 1.5G / 3G Frame Rates: P23, P24, P25, P29, P30, P50, P59, P60, 150, 159, 160

Dimensions

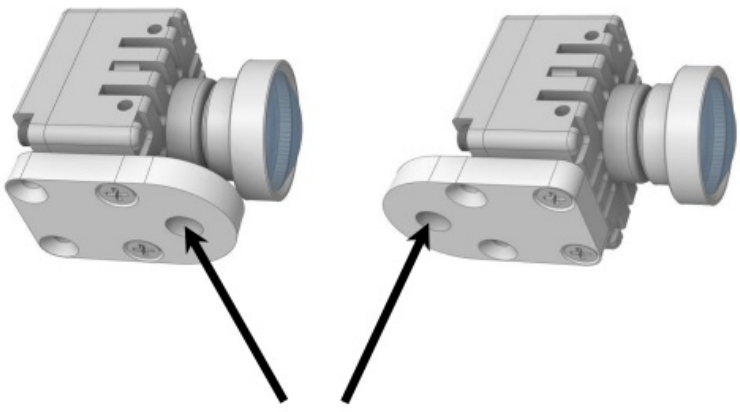
The camera has a size of 28x28x23 mm, refer to the technical drawing below for details.



All mount holes
M2.5x0.45 ISO ↧5mm
TAP DRILL 2.05 ↧5,75mm

Camera Mount

- The camera offers 8 M2,5 mount holes for CUStom mounting according to the dimensions diagram.
- The camera comes with a small mount bracket with a 1/4″ tripod thread for fast integration.
- The mount bracket can be screwed at top or bottom of the PROTON CAM. Use the included screws (M2.5×8) to mount the holder as shown below. The 1/4″ thread can be headed to the back or front of the camera for more mounting options in tight spaces. See pictures for details.

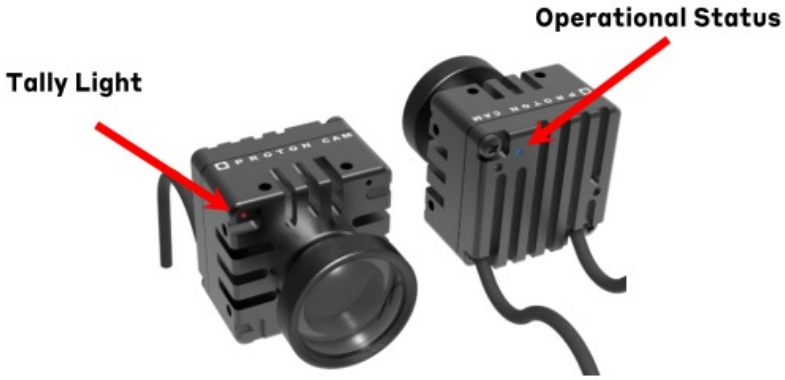


¼" Tripod thread

LEDs

The camera has two status lights:

- RGB LED for operational status on the backside:
  - Green / Cyan blinking: Boot
  - Blue blinking: Operation
  - Yellow blinking: Busy
  - Red blinking: Error
- Red Tally LED on the front: Can be controlled via software (system tally command)
- Please Refer to the Reference Manual for more details.



Power and Heat Management

- PROTON CAM has the lowest power consumption on the mini camera market (N2.5 W), but due to the extremely small form factor the camera can get hot (55-60 oc).
- These are the power factors that can be optimized:

Factor	Action / Impact
Temperature	Higher temperature increases power usage. Example: +20°C (e.g., from 50°C to 70°C) adds ~200 mW. Better cooling = lower power consumption. Typical consumption: 2.3 W at p60 (cool), up to 2.7 W in hot enviro nments.

Factor	Action / Impact
Operational Voltage	Power supply efficiency varies with voltage. **Best efficiency** around **8 V**. **Worst efficiency** at **25 V** (adds approx. ±100 mW).
Video Mode	High frame rates (p60, i60) consume more power. Switching to lower frame rate (e.g., p30) saves ~200 mW if high frame rates aren't required.

Overtemperature Protection

- The camera has internal temperature monitoring and will shut down when over temperature is detected (90 0 C). When the temperature drops sufficiently, the camera resumes operation,
- Over temperature events are logged and can be checked using the system error and system temp count commands (see Reference Manual for details). Note that the error log is not persistent and must be read before the camera gets powered off. The over temperature event counter is stored persistently.

Connection

The camera has two connection cables:

- Power 1 Control Cable: Hirose HRIOA-7P-6P(73)
- RS485 (120 Termination in camera)
- Coax Cable: Belden 179DT with BNC Plug
- Power can be supplied in 4 ways:
- Connect to a CyanView CIO:
- https://support.cyqnview.com/docs/Mqnuqls/ClO/ClOMq nuqt
- Connect to a power supply (ref: PCI-ACC-PSU) or a PC with a PROTON PIO box (sold separately, ref: PCI-ACC- PIO).
- Use a breakout cable (sold separately, ref: PCI-ACC- FOUT).
- Cut the power cable and use a custom power supply.

Power / Control Cable

Signal	Cable Color	Breakout Cable	HR10A-7P-6P Pin
RS485 A+	White	White	1
RS485 B+	Black	Green	2
GND	Blue	Black	5
Power	Brown	Red	6

The Hirose HRIOA-7P-6P(73) connector is directly compatible with a Cyanview CIO for simple integration.

Coax Cable

- The coax cable transports the 3 Gbit SDI video signal. Bad extension cables or unprofessional shortening may cause signal loss. This work should only be done by trained experts and checked with an SDI analyzer to confirm the required performance is achieved.
- The following components and tools from www.coqx-connectors.com are used in the camera:
- Cable: Belden 179DT
- BNC Straight Jack: 75R 3GHz – 10-500-836
- Stripper: 96-312D
- Crimping Tool: 96-336U
- BNC Plug 75R: 10-005-B36-ABl

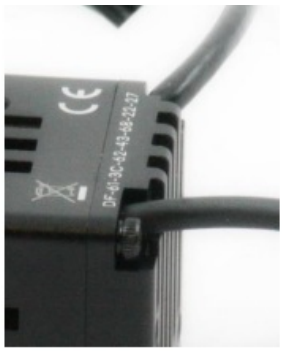
Coax Cable Extension

- The camera has a 1.8m (6 feet) cable but can be extended with a barrel connector or SDI extension cable.
- For extension the following cables have been tested as a reference. SDI defines 40dB loss for maximum cable length.
- This table is based on conservative 35dB for additional headroom.

Cable Type	Max Length (3G SDI)
RG179	40 m
RG-59	50 m
Vector 08/3.7	55 m
Belden 1694A	120 m
Belden 4694A	130 m

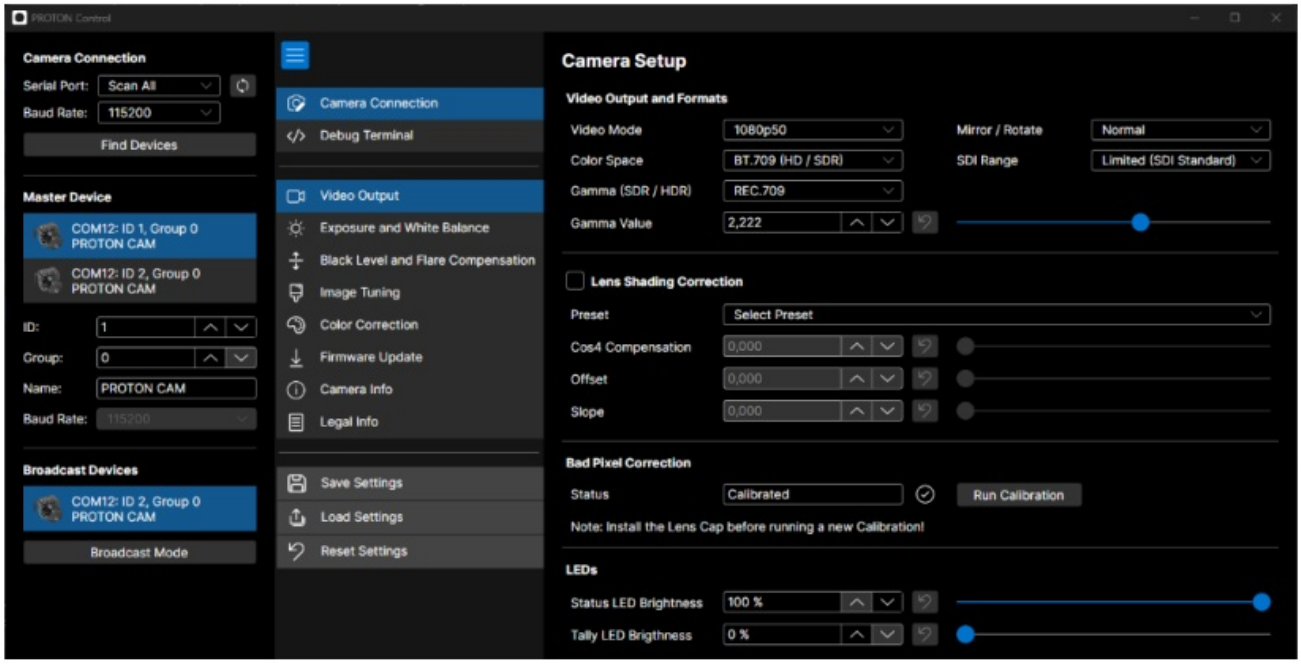
Cable Handling

- The cables are directly mounted into the camera and are clamped internally, so they will not slip out.
- The design of the housing is done in a way that enables the cables to be routed in different directions. This simplifies integration in tight spaces.
- The cables are sensitive to breaking. Therefore, do not bend the cables many times around tight corners.
- In case the camera is mounted permanently, this is not an issue. For rental cameras, hard bending is not recommended since the cable can develop an internal break. Please advise the rental partner.
- Damage to the cable is not covered by the warranty but can be repaired at our service center for a fee.
- The camera is very tough but be nice to it



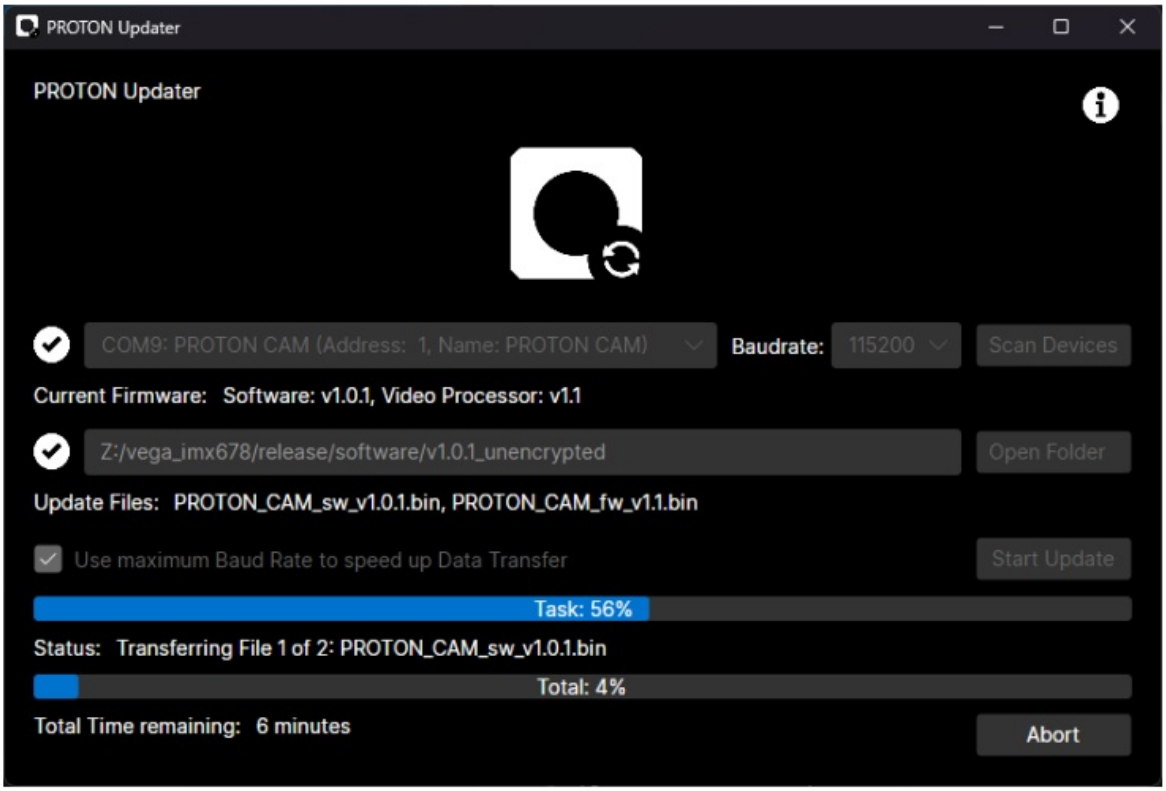
Control

- The camera is controlled via an RS485 interface. Details about the PROTON OS protocol can be found in the Reference Manual.
- The camera is supported by Cyan View RCPs with CIO. Just plug and play to operate the camera:
  - www.cyqnview.com
- The camera can also be controlled by our easy-to-use PROTON Control software which is available for PC and MAC and can be downloaded here:
  - www.proton-cqmerq.com/downloads



Firmware Update

- The camera's firmware can be updated by the customer. For this a PROTON PIO (ref: PCI-ACC-PIO) and a pc or MAC are required.
- The PROTON Updater software can be found on:
  - Refer to the Reference Manual for details on the firmware update process.



Lenses

WARNING: The camera supports ultra-wide angle and is very compact. Therefore, the distances between the lens, the inbuild IR cut filter and sensor are VERY short.

You can screw the lens into the filter and damage it. Read the instructions below carefully to prevent damage to the camera.

Lens Mount and Standard Lens

The PROTON CAM does have a M 12 lens mount.

The camera is equipped with the following lens:

- 3.2 mm F 2.3 distortion free lens

- 97 / 68 degree (H/ V)

The lens can be changed by the user. PROTON is offering a wide range of tested high quality lenses. Visit our webpage for details.

FOCUS Adjustment

The focus can be changed by turning the lens.

IMPORTANT: To prevent damage to the IR cut filter, NEVER turn the lens inside the camera without monitoring the live image.

- Only this way you can “see” if the lens is screwed in too far and is about to touch the filter. The IR cut filter is 9 mm away from the outer thread edge.

Procedure to set the focus:

1. Start the camera to get live image
2. Turn the lens OUT (turn left)
    - Check if focus gets better
        - Yes Continue until focus is set
        - No Go to step 3
    - Minor toggling in both directions until focus is good
3. Turn the lens IN (turn right)
    - Check if focus gets better
        - Yes -Y Continue until focus is set
    - Minor toggling in both directions until fOCUS is good
    - In case you are losing focus go back to step 2
    - The “safe” zone is small (NO.5mm = 1 full turn), be careful.

Change Lens

IMPORTANT: To prevent damage to the IR cut filter, NEVER turn the lens inside the camera without monitoring the live image.

Only this way you can “see” if the lens is screwed in too far and is about to touch the

filter, Change procedure:

1. Turn the lens OUT (turn left) until it falls out (about 8 mm)
2. Start turning the new lens IN (turn right)
    - The first 2.5 mm is no resistance, it is very smooth
    - Then you should feel a resistance (there is an O-ring to lock the lens)
    - Turn ON the camera to get life image before you proceed!
    - After about 5mm in there is a 2nd O-ring, so the resistance increases slightly.
    - The focus is around 1.5 mm further in.
3. Continue with the “set focus” procedure as described in chapter Fehler! Verweisquelle konnte nicht gefunden werden..

Safety

- The camera gets hot during operation. This is normal on a passively cooled device.
- Especially in a hot temperature environment the temperature can reach above 60 oc.
- Touching may be harmful or cause burns.
- In case you operate the camera in those scenarios, take precautions when handling the camera.
- It is recommended to use a solid camera mount to improve cooling, see chapter 3.5 for details on power and heat management.
- The internal temperature is monitored to get an indicator of current operating condition. The camera is protected from over temperature, It will shut down in this case. When the temperature drops, the camera will resume operation, See chapter 3.5. I for details on the over temperature protection.

Warranty

- PROTON Camera Innovations GmbH warrants that this product will be free from defects in materials and workmanship for a period of6 months from the date of purchase. Ifa product proves to be defective during this warranty period, PROTON Camera Innovations GmbH, at its option, either will repair the defective product without charge for parts and labor or will provide a replacement in exchange for the defective product.
- To obtain service under this warranty, you the Customer, must notify PROTON

Camera Innovations GmbH of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to a designated service center nominated by PROTON

- Camera Innovations GmbH, with shipping charges pre-paid.
- Customer shall be responsible for paying all shipping changes, insurance, duties, taxes, and any other charges for products returned to us for any reason.
- This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. PROTON Camera Innovations GmbH shall not be obligated to furnish service under this warranty: a) to repair damage resulting from attempts by personal other than PROTON Camera Innovations GmbH representatives to install, repair or service the product, b) to repair damage resulting from improper use or connection to incompatible equipment, c) to repair any damage or malfunction caused by the use of non PROTON Camera Innovations GmbH parts or supplies, or d) to service a product that has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product.
- THIS WARRANTY IS GIVEN BY PROTON CAMERA INNOVATIONS GMBH IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. PROTON CAMERA INNOVATIONS GMBH AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. PROTON CAMERA INNOVATIONS GMBH'S RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE WHOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WETHER Proton Camera Innovations GmbH OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES. PROTON CAMERA INNOVATIONS GMBH IS NOT LIABLE FOR ANY ILLEGAL USE OF EQUIPMENT BY CUSTOMER. PROTON CAMERA INNOVATIONS GMBH IS NOT LIABLE FOR ANY DAMAGES RESULTING FROM USE OF THIS PRODUCT.
- USER OPERATES THIS PRODUCT AT OWN RISK.

Certifications

- This equipment has been tested and found to comply with the limits for a Class B digital device in a residential environment according to the following rules:
- European Council Directive- EMC Directive 2014/30/EU.
- General Product Safety Directive (GPSD)
- RoHS Directive 2011/65/EU + 2015/863
- FCC rules part 15.

Recycling

- You can return an old or damaged PROTON Camera Innovations product for recycling. The recycling is free of charge.
- For recycling, please request an RMA form for your device via email from
    - weee@proton-carnera.com
- We need the following information:
- Subject: Recycling
- Product name
- Product serial number
- Can be found on bottom of product
- Please ship the product at your expense to our office, including the RMA form.
- PROTON Camera Innovations GmbH
- Fockestraße 10 30827 Garbsen Germany
- By sending in the product, it will be owned by Proton Camera
- Innovations GmbH and will be recycled according to German law.

FAQS

Q1: What video resolutions and frame rates does the PROTON 4K Mini Broadcast Camera support?
A1: The PROTON 4K Mini supports full HD 1920×1080 video with various frame rates, including P23, P24, P25, P29, P30, P50, P59, and P60, as well as higher rates like 150, 159, and 160 fps for slow-motion capture.

Q2: What are the power requirements and operating voltage for the PROTON 4K Mini Camera?
A2: The camera operates on a voltage range of 4.5 V to 25 V, with the best power

supply efficiency around 8 V. It consumes about 2.5 W at 1080P60 but can vary slightly depending on temperature and video mode.

Q3: How does temperature affect the camera's performance and power consumption?

A3: Higher operating temperatures increase power consumption. For example, a 20°C rise in temperature can add around 200 mW. Better cooling through proper mounting can reduce power usage and maintain optimal performance.

Documents / Resources

	PROTON 4K Mini Broadcast Camera [pdf] Instruction Manual 4K Mini Broadcast Camera, Mini Broadcast Camera, Broadcast Camera, Camera

References

- User Manual

4K Mini Broadcast Camera, Broadcast Camera, camera, Mini Broadcast Camera,

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