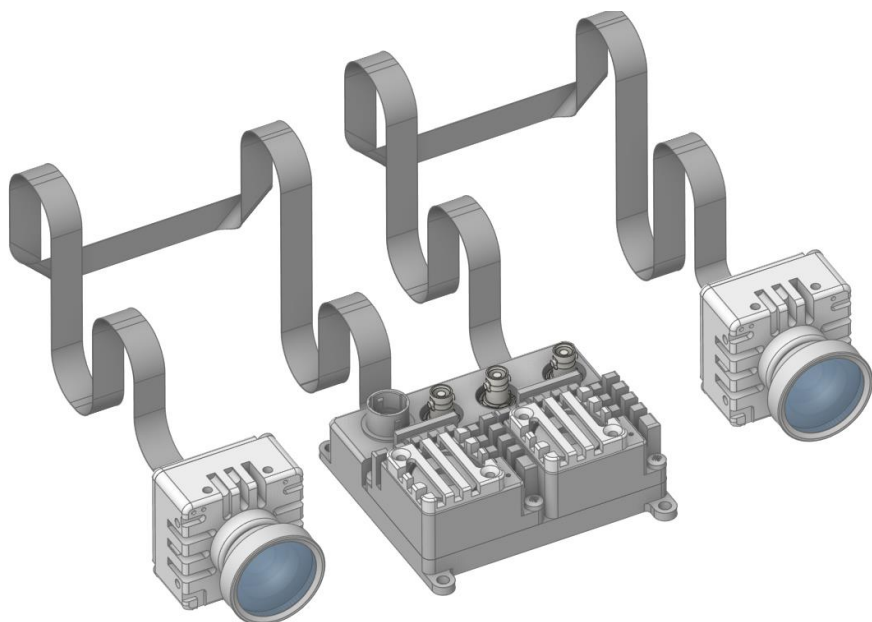




Operational Manual

PROTON 4K 3D





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2 Welcome

Dear content creator,

thank you for choosing our PROTON 4K 3D for your next project.

PROTON 4K 3D is the smallest 3D 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.

4 Special Notes on 3D

4.1 Dual camera design

The PROTON 4K 3D is based on two PROTON 4K cameras with a custom synchronization board and a custom firmware.

They have separate SDI outputs which are labeled SDI A and SDI B.

Internally, each of the cameras has a unique RS485 ID for control. By default, the “A” camera has ID 1 and “B” has ID 2.

For simple control both cameras can be controlled together via broadcast group 0.

The PROTON CONTROL software provided for the 3D camera detects this and presents and controls the camera as one 3D camera.

Cyanview also supports this by settings up a control bus.

Details can be found on our support net:

<https://doc.proton-camera.com/docs/integrations/cyanview#control-a-camera-bus>

For custom controls or maintenance like firmware updates it is important to be aware that we have 2 cameras combined.

Refer to the Reference Manual chapter “2.7 3D Stereo Camera Rigs” for details.



4.2 Synchronization

Both cameras in a 3D camera automatically sync to each other. This is the default behavior of a camera after factory reset.

You can synchronize multiple cameras to create a cluster.

For this the camera does have a SYNC connector.



This connector provides a bidirectional signal to connect multiple cameras.

You can link two 3D cameras directly with an HD-BNC cable.

It is also possible to sync multiple cameras by distributing the signal to multiple cameras using BNC T-connectors. The wiring should stay in the range of a few meters (limit not tested yet).

For any external synchronization it is required to configure the cameras in the correct mode.

3 different synchronization modes are supported:

Mode	Function
Off	Both cameras of the 3D rig run independently of each other



Master (default)	<p>Both cameras of the 3D rig will sync to each other.</p> <p>The camera also provides a sync signal output on the SYNC connector to enable synchronization of additional slave cameras.</p> <p>When connecting multiple 3D cameras only ONE master must be active in the system.</p>
Slave	<p>Both cameras of the 3D rig wait for an external sync signal from a master camera.</p>

The mode can be changed with PROTON CONTROL or manually via RS485 (system sync <mode>). Please check the reference manual for details.

Example: Sync 2 cameras

CAM 1: Master

CAM 2: Slave

Example Sync 3 cameras

CAM 1: Master

CAM 2: Slave

CAM 3: Slave

In case you configure multiple sync masters, the camera will not sync (even a master camera). The sync signal is collision-



save, no damage is done to the camera in case of wrong configuration.

Note:

The sync signal has a special PROTON format. This signal is not compatible to bi-level or tri-level sync.

On request PROTON Camera Innovations can provide converter boxes to integrate into a tri-level sync infrastructure.

5 Technical data

5.1 Overview

Size	2x Head: 28x28x19.5 mm 30cm flex cable 1x Video Processor: 56.5x54x22mm
Weight	Tbd. Head Tbd. Video Processor
Operation voltage	11,5 V – 25 V (Camera has reverse polarity protection)
Power	12 W (4KP60, cold camera)
Operational temperature	-30 ... 60 °C
Lens mount	M12 / S-mount Inbuild high quality IR cut filter. Supporting



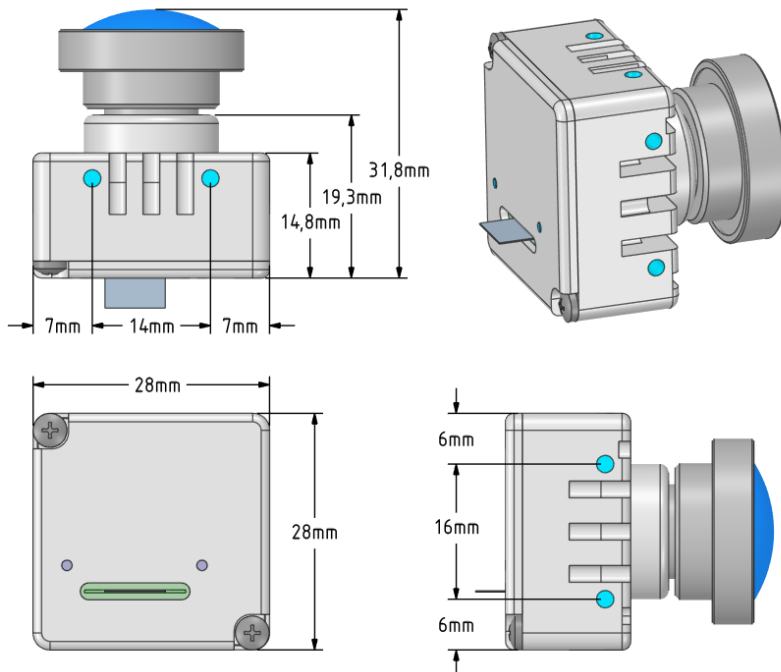
	lenses with no IR filter with perfect color reproduction.
Sensor	1/1.8" 3840x2160 2 µm pixel 7.68mm x 4.32mm – 8.8 mm diagonal. 12 bit dynamic (72 dB)
FOV	124 / 85 degree (H / V) with a 2.2 mm lens 97 / 64 degree (H / V) with a 3.2 mm lens (factory lens is 3.2mm)
ISO Base sensitivity	75 – 2400 200 – 6400 (low light mode)
Shutter	6 µs ... 1/FPS
Video modes	UHD + FHD SDI 12G, 6G, 3G, 1.5G P23, P24, P25, P29, P30, P48, P47, P50, P59, P60 FHD also supports I50, I59, I60

5.2 Dimensions

5.2.1 Head

The 2 camera heads have a size of 28x28x34.5 mm each, refer to the technical drawing below for details.

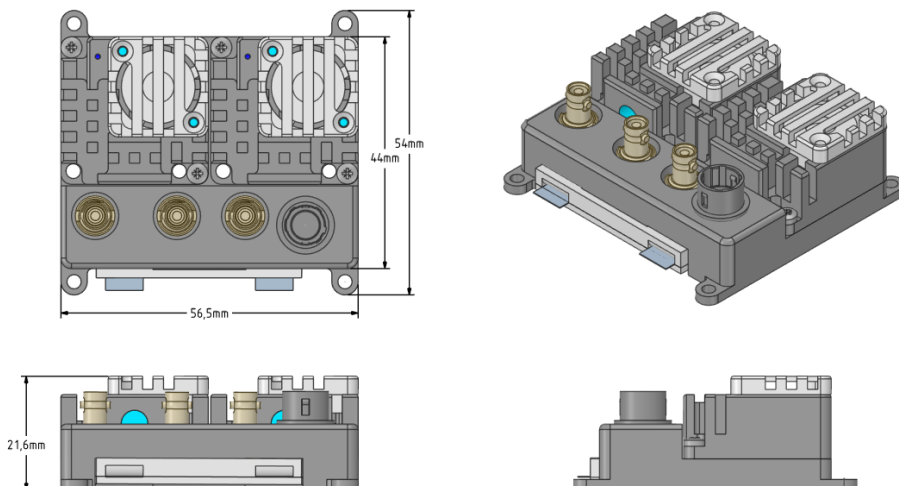
The flex cable has an efficient length of about 30cm.



All mount holes are M2.5mm

5.2.2 Video Processor

The video processor unit has a size of 56.5x54x21.6 mm, refer to the technical drawing below for details.

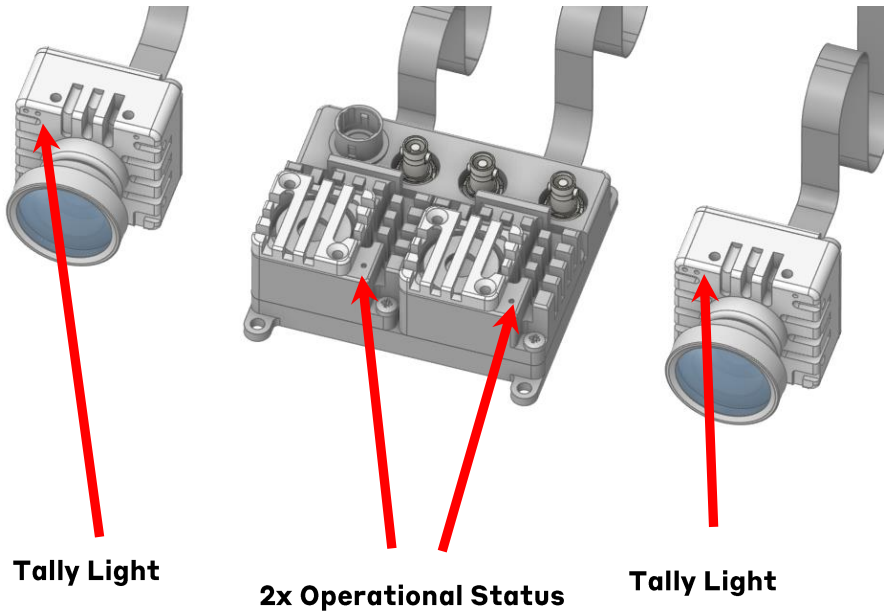


5.3 LEDs

The camera has 2x 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.





5.4 Power and Heat Management

PROTON 4K 3D has the lowest power consumption on the mini camera market ($\sim 10\text{--}12\text{ W}$), but due to the extremely small form factor the camera can get hot ($75\text{--}85\text{ }^{\circ}\text{C}$).

High temperature is no problem for PROTON 4K 3D since it is built from industrial graded components with extended temperature range.

These are the power factors that can be optimized:

Factor	Action
Temperature	The hotter the camera gets, the more power it will use: $+20\text{ }^{\circ}\text{C}$ (e.g. $60^{\circ}\text{C} \rightarrow 80\text{ }^{\circ}\text{C}$) = $+1\text{ W}$. Better mounting \rightarrow Better cooling \rightarrow Lower power consumption A cool camera consumes $\sim 10\text{ W}$ at 4Kp60. In a hot environment it can go up to 12 W
Operational voltage	The efficiency of the power supply depends on the operating voltage. Best efficiency is achieved around 12 V , worst at 25 V ($+600\text{ mW}$).
Video mode	p60 and i60 video modes have the highest power consumption. In case high frame rates are not needed, by switching to p24 the power will go down to 9 W

5.4.1 Cooling Fan

PROTON 4K 3D is the smallest 4K 3D camera for broadcast with lowest power in market. This small size needs some thermal considerations.

12 W cannot be passively cooled with a very small housing.

To guarantee stable and uninterrupted operation, the camera has an inbuild fan. The fan keeps the camera operational in difficult situations.

This enables sufficient cooling, even in case that the camera is not mounted to any metal / housing.

For the 3D version the fan is set to “always on” by default to keep it as cool as possible.

The temperature of the video processor will be in the range of 60-70 °C.

The camera head itself is low power and will barely warm up.

The camera will shut down when the video processor reaches 90 °C but this does not happen if the environment temperature is not too high and there is some airflow.

5.4.2 Overtemperature Protection

The camera has internal temperature monitoring and will shut down when over temperature is detected (90 °C). When the temperature drops sufficiently, the camera resumes operation.

High temperature is no problem for PROTON 4K 3D since it is built from industrial graded components with extended temperature range.

Even an over temperature event will not damage the camera. This is mainly to prevent injuries by burning.

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.

6 Connection

The camera has 4 connectors:



Connector	Signal	Type
SDI A	12G SDI signal of camera A	HD-BNC Amphenol 034-1028
Sync	Proton Sync signal	HD-BNC Amphenol 034-1028
SDI B	12G SDI signal of camera B	HD-BNC Amphenol 034-1028
Power	Power and RS485 control	Hirose HR10A-7R-6PB(73)



Make sure to use high quality SDI cable to support 12G operation. On short cables (~1-3m) we found that available 6G grade cables work well.

The camera is supplied with a power break out cable to adapt from Hirose HR10A-7P-6P(73) to a HR10A-7P-6S(73) connector.

Power can be supplied in 4 ways:

- Connect direct to a CyanView CIO:
<https://support.cyanview.com/docs/Manuals/CIO/CIOManual>
- Connect to a power supply PROTON PIO box (included in the box).
- Use a breakout cable (included on the box).
- Cut the power cable and use a custom power supply.

6.1 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 HR10A-7P-6P(73) connector is directly compatible with a **Cyanview CIO** (www.cyanview.com) for simple integration.

7 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.cyanview.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-camera.com/downloads

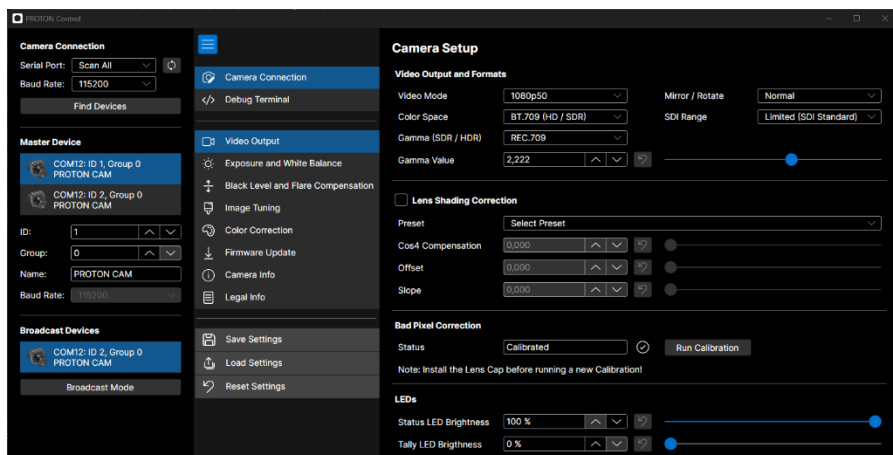
NOTE:

The PROTON 4K 3D needs special control software.

Please contact PROTON for a download link.

Until further notice, do not use the software from the download page: www.proton-camera.com/downloads

This will likely not detect the camera correctly.



8 Firmware Update

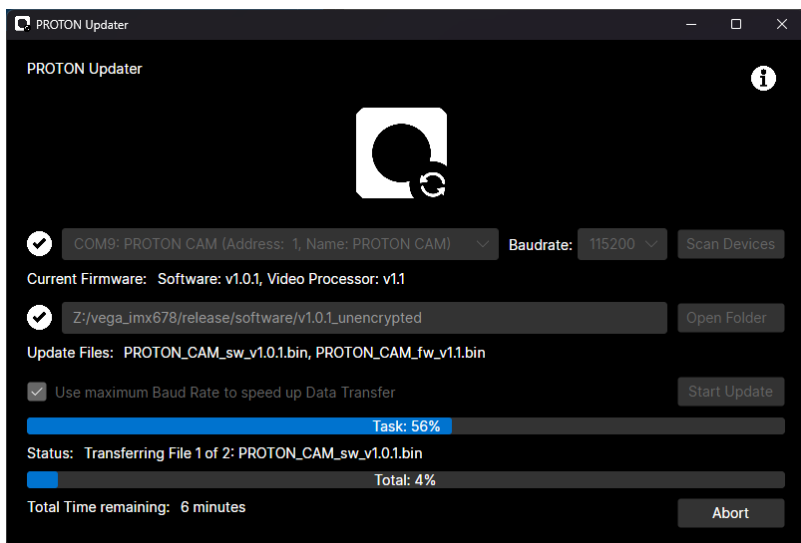
The camera's firmware can be updated by the customer. For this a PROTON PIO (ref: PCI-ACC-PIO) and a PC or MAC are required.

The PROTON Updater software can be found on:

www.proton-camera.com/downloads.

Refer to the Reference Manual for details on the firmware update process.





9 Lenses

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

9.1 Lens Mount and Standard Lens

The PROTON 4K 3D does have an M12 lens mount.

The camera is equipped with the following lens:

- 3.2 mm F2.3 distortion free lens

- 97 / 68 degrees (H/V)

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

9.2 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)
 - a. Check if focus gets better
 - i. Yes → Continue until focus is set
 - ii. No → Go to step 3
 - b. Minor toggling in both directions until focus is good
3. Turn the lens IN (turn right)
 - a. Check if focus gets better
 - i. Yes → Continue until focus is set
 - b. Minor toggling in both directions until focus is good
 - c. In case you are losing focus go back to step 2

The “safe” zone is small (~ 0.5 mm = 1 full turn), be careful.

9.3 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)
 - a. The first 2.5 mm is no resistance, it is very smooth
 - b. Then you should feel increased resistance (there is an O-ring to lock the lens)
 - c. Turn ON the camera to get live image before you proceed!**
 - d. After about 5 mm there is a 2nd O-ring, so the resistance increases slightly.
 - e. The focus is around 1.5 mm further in.

→ Continue with the “set focus” procedure as described in chapter 9.2.

10 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 80 °C.

Touching may be harmful or cause burns on longer contacts.

In case you operate the camera in those scenarios, take precautions when handling the camera.

The product is tested safe according to EN 62368-1 (2025-01).

It is recommended to use a solid camera mount to improve cooling, see chapter 5.4 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 5.4.1 for details on the over temperature protection.

11 Warranty

PROTON Camera Innovations GmbH warrants that this product will be free from defects in materials and workmanship for a period of **6 months** from the date of purchase. If a 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 WHETHER 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.



12 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.



13 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-camera.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.