

AVT ILMENAU

User Manual 4K-Minicam-system EMC4K

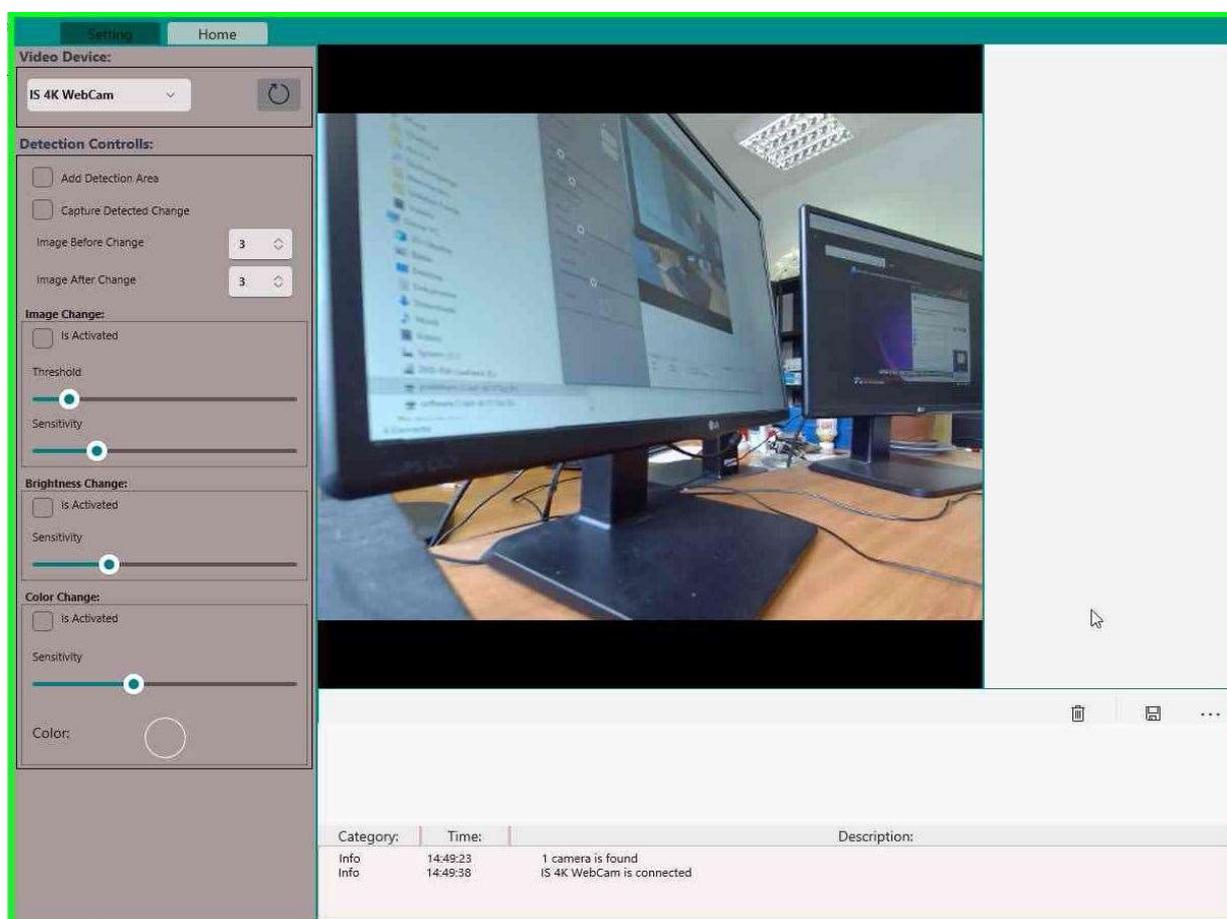


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Software: AVT-miniCam V1.0.05 (30.10.2023)

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List of abbreviations

EMC	Electro-Magnetic Compatibility
FC/PC	Fiber Connector / Physical Contact
PC	Personal Computer
USB	Universal Serial Bus
FOC	Fiber Optic Cable
FC	Fiber cable

Introduction

With the AVT 4K-MiniCam system, you have acquired a variable, easy-to-connect measuring device with small dimensions. The data transmission is done optically with a Kevlar reinforced high flexible fiber optic cable (FOC). The connection to personal computers (PCs)/laptops is made with a USB 3 connector (type A). Due to the optional possibility to use an internal rechargeable battery, you do not need an additional power supply in the laboratory. However, you can also ensure permanent operation without an internal battery using external power supplies. Mechanically, there is a connection for standard tripods or additional screw fastenings.

The electromagnetic **emissions** of the 4K-MiniCam camera (while in operation with internal accumulator) are **limited** within a **noise margin** range. The maximum **resilience** without functional limitations is guaranteed at field strengths **above 100 V/m (standard)**, or **up to 400 V/m** (depending on the selected option).

The 4K-Minicam is the perfect measuring and monitoring device instrument in your laboratory due to the pre-selection of the camera lens focal length, the definable cable lengths of up to more than 50 m, the option of using internal rechargeable battery or external power supply, and the resistance to high field strengths tailored to your application. The selectable standard focal lengths are for 4K (3840 x 2160) as follows (or customer defined acc. to requirements):

Focal length /mm	3.2	4.5	6.8	12
Horizontal angle of view	103°	68°	48°	30°
Vertical angle of view	70°	42°	28°	17°
Hor. view in 1 m distance /m	2.5	1.35	0.89	0.54
Ver. view in 1 m distance /m	1.4	0.76	0.50	0.30

Together with the zoom options in the software (10 levels), a large field of view can also be observed more precisely. Due to its high resolution, the camera does not have any moving parts. Panning and tilting are also possible in the zoom, without the need for a complex mechanical pan-tilt unit.

1. Operating Conditions and Safety Instructions

The 4K-MiniCam is designed for indoor applications only. For outdoor applications, please contact the manufacturer (AVT). The permissible ambient temperature and humidity must be observed. The camera must never be exposed to excessive temperatures!

The voltage rating must be observed for connecting the camera and the charger to power. Only use the supplied AC adapter to charge the internal battery. The charger, and the external power supply (for cameras without an internal battery) perform differently and have different connectors. Always plug only connections that fit together (external power supply: 4-pin, battery charger: 8-pin).

If the fiber optic cables are fed through smaller diameter conduits, make sure that the cables are not bent too much (see technical data) to avoid damage.

If the camera is used in battery mode, the charging socket must be properly screwed to the cover to stop interference from entering.

Only use the charging socket with the intended plug! Never short-circuit! Never use greater forces when plugging in the connections! Screw together after plugging in.

Do not open the device under any circumstances! This may result in a defect or failure. Opening also voids any warranty claim! The device may only be opened by the manufacturer or an authorized representative of the manufacturer.

Always pay attention to the electrical connection and the surrounding conditions. One must adhere to the intended use.

When using the FC/PC connections (optional), make sure that first, the inner part of the cable is turned slightly until it engages in the guides, and only after that the outer screw connection is tightened. Without this engagement, the connection will not be established.

2. Scope of Delivery

The scope of delivery includes the 4K-MiniCam, a power supply unit including cable for charging the internal battery (optional with internal battery), a measuring device for determining the charging current (optional with internal battery), a power supply unit for operation (option without battery), a fiber optic cable (FOC) with USB-A connector version USB 3.0. Additional accessories are supplied for the demonstrator camera or are optional (see Figure 1).

The FOC is firmly connected on the camera side by an EMC-proof bend protection sleeve. Due to the small size of the USB-A connector on the receiving side, it can also be routed through small openings. *Optionally*, the FOC with FC/PC connections is routed through the housing. The user manual is either enclosed or provided online for download.



Figure 1: Standard scope of delivery of the AVT 4K-MiniCam
(left: without internal accumulator, right: with internal accumulator)

Delivery scope left (without accumulator)	Delivery scope right (with accumulator)
1) 4K imaging camera (4K-MiniCam, $U_n = 5V$, $P_n = 2.5W$)	1) 4K imaging camera (4K-MiniCam, $U_n = 5V$, $P_n = 2.5W$, $P_{charge} = 6W$, $I_{max} = 2.0 A$)
2) Kevlar reinforced FOC 10m...100m, min. bending radius 30 mm	2) Kevlar reinforced FOC 10m... 100m, min. bending radius 30 mm
3) USB 3.0 standard A plug	3) USB 3.0 standard A plug
4) Power supply ($U_{nprim} = 230V$, $U_{nsek} = 5V$, $P_n \geq 6W$)	4) Battery charger ($U_{nprim} = 230V$, $U_{nsek} = 5V$, $P_n = 10W$, $I_n = 2.0 A$)
5) Power connection cable (color may vary)	5) Charging monitor with voltage and current display (color may vary)
	6) Charging connection cable for camera

Other:

Case as protective packaging

Key for metal case inside for internal use (optional)

Content may vary depending on the order of optional components! The packaging material may also vary.

3. Assembly/Use

To use the 4K-Minicam, the data transmission path is assembled. As a standard setup, the data cable (FOC) is led directly out of the camera housing via an EMC-proof bend protection sleeve.

The AVT 4K MiniCam is very easy to use via Plug & Play (UVC standard). The MiniCam software is designed for the Windows operating system (version ≥ 10). One side of the FOC is connected inside the camera and comes out directly as a fiber optic at the back. The other side of the FOC has a USB 3.0 standard A connector for PC or laptop. **The USB connection should always be plugged in first!**

If the camera is then connected to the power supply (if supplied without internal battery, 4 pin connector) it is ready for use. For cameras with an internal battery, the battery must be charged before the camera can be turned on (8 pin connector) and the switch on the back (internal battery only) can turn the camera on. The connections are shown in Figure 2.

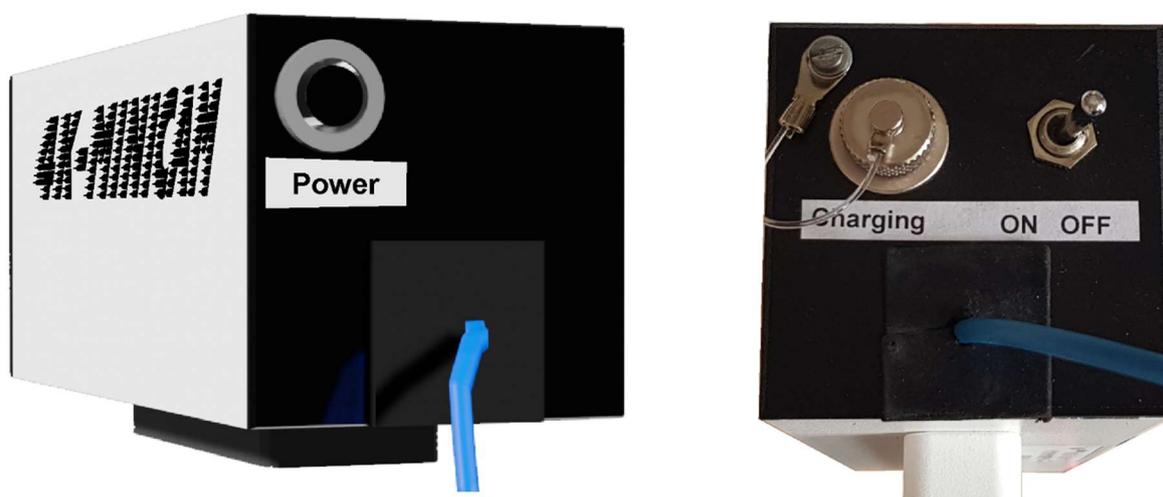


Figure 2: Rear view of the 4K-MiniCam with view of power, charging and switch (left: without internal accumulator, right: with internal accumulator)

The USB plug is inserted into a USB 3 socket (blue) of the PC or laptop to operate the camera as shown in Figure 3 (like standard USB connector).



Figure 3: Plugging in the USB connector on the PC/laptop (USB 3 blue)

4. Charging the Battery (optional)

If the camera is used with battery option, the charging socket must be properly screwed to the cover to prevent interference fields from entering!

The battery is designed for permanent operation of the camera for at least 8 hours. There is also a production-related spread of the operating time, but it is over 8 hours. If the battery needs to be charged, it is done with the supplied charging device and the charging adapter. After unscrewing the cover, the adapter is inserted into the charging port and screwed in place. The correct contact is only ensured when the plug is completely screwed in!

The charging voltage and the charging current can be observed if the charging adapter cable is connected to the battery charger power supply via the charging monitor measuring device (Figure 4).



Figure 4: Measuring device for loading the 4K-MiniCam (colour can vary)

The current values for voltage and current flow can be read on the display. Furthermore, the accumulated charge is measured. The charge display is reset by pressing the button. If the current flow drops from a value above 0.9 A to 0 or almost 0 during charging, the battery is fully charged. If this value stays at 0.2... 0.3 A for a long time, the battery is charged, and the camera is switched on.

5. Technical Specifications

Optics		
Focal length	3.2 mm / 4.5 mm / 6.8 mm / 12 mm	
Focus distance	depend on focal length	
Horizontal angle of view	103° / 68° / 48° / 30°	
Vertical angle of view	70° / 42° / 28° / 17°	
Hor. view in 1 m distance /m	2.50 / 1.35 / 0,89 / 0,54	
Ver. view in 1 m distance /m	1.40 / 0.76 / 0.50 / 0.30	
Optical format, sensor	1/2,5", CMOS Sony IMX317	
Resolutions		
4K-resolution	3840x2160 (pixel size 1,62 µm x 1,62 µm)	
2K-resolutions	2048x1536, 2688x1512, 2592x1944	
HD-resolutions	1280x720, 1280x 960, 1600x1200, 1920x1080	
Small size (below HD)	640x360, 640x480, 800x600, 960x540	
Frame rates	30 fps (all resolutions), 60 fps (only FHD in MJPEG)	
General Information		
USB video class compliant	yes, Microsoft WHQL certified	
Temperature operating range	-10° C ... 50° C	
Available length of fiber optic cable	10 m, 20 m, 30 m, 50 m, 70 m, 100 m	
Data- and control interface on PC/Laptop	USB 3.0 (plug A)	
Electrical specifications		
	min	max
Supply voltage (DC, 5 V typ.)	4.85 V	5.25 V
Power (camera without battery charging)	0.6 W	2.6 W
Current (operation / charging battery / operation and charging)	0.11 / 0.0 / 0.11 A	0.52 / 2.0 / 2.52 A
Delivery of power supply / charger / external battery	Yes (without internal battery) / sold as option internal battery / sold as option external battery	
Dimensions		
Camera Length without Connections	126 mm / 186 mm (with battery inside)	
Width	50 mm	
Height (with foot)	50 mm (60 mm)	
Weight	385 g	

Order Information

AVT – EMC4K - xxx - xx - A

EMC hardened
4K-MiniCam

Focal length
032: 3.2 mm
045: 4.5 mm
068: 6.8 mm
120: 12 mm

Version
01: version 1

Internal battery
-: without battery
A: with battery

Example: AVT-EMC4K-045-01-A

6. Operation of the miniCam Software (free of charge)

The basic software for operating the AVT 4K-MiniCam is called *miniCam*. When installing the software, the necessary certificates and drivers are installed, with which the connection to the camera can be established. When the optical converter is connected to USB 3.0 and the camera is powered or switched on (A option), it is recognized in the software. The name of connected cameras is given by the USB Hub of the PC or laptop, with which the software can also distinguish between different cameras.

6.1 Installation of AVT *miniCam* Software

1. Download the *miniCam* software.
2. Open the software directory.
3. Follow the document “AVT_MIniCam-Installation_V1_01_EN.pdf” for installation instructions.

6.2 Connecting the 4K-MiniCam to PC / laptop

When the camera is connected to the PC / laptop for the first time, the windows operating system might show some message that the software wants to access the camera (Figure 5). Please choose yes for all the messages.



Figure 5: Giving camera access to the *miniCam* software

6.3 Main Areas of the AVT *miniCam* Software

The *miniCam* software has a very easy to understand user interface. The main area is shown in figure 6 below.

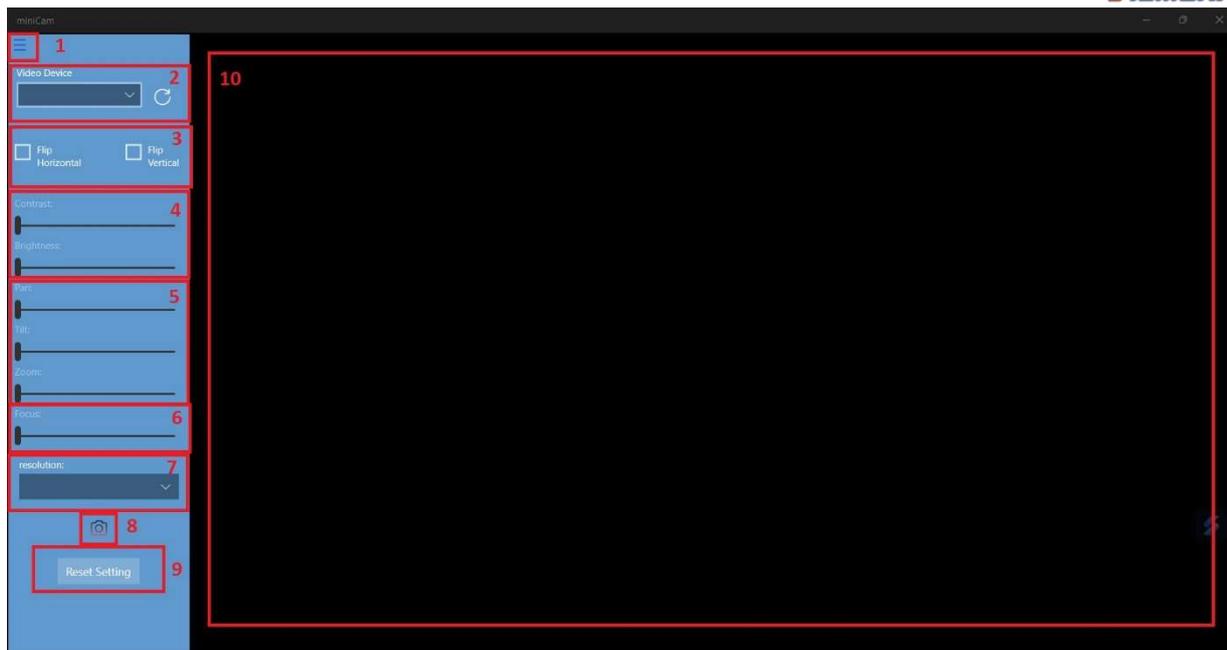


Figure 6: *miniCam* software interface of the AVT 4K-MiniCam

1. You can show and hide the blue pane on the left with clicking the three horizontal lines on the top left of the window.
2. Multiple AVT 4K-MiniCams cameras can be connected to the laptop / PC simultaneously. From the “Video Device” drop down the different video cameras can be selected. In case new 4K-minicam(s) are connected while the software is running, all the connected cameras can be shown in the drop down by pressing the reload button on the right of the drop down.
3. The images can be flipped both horizontally and vertically by checking the respective boxes.
4. As shown in Figure 6, both contrast and brightness can be changed. The values range from 0 to 255.
5. During an active zoom, the software can also pan left and right horizontally and tilt vertically (in the range from -10 to 10). The Software supports zooming up to a magnification factor of 10
6. Here you can regulate the Focus of the Camera. This function depends on the selected camera and has no function yet for the current 4K MiniCam.
7. The software supports many different resolutions (see technical specifications in section 5), which support three video coding formats: NV12, YUY2 and MJPEG. In version 1.0.5 it is separated in Resolution, Format and Frame Rate and has to Set after choice.
8. By pressing this Button an image of the current frame under use of specified settings is saved into your Image-Folder under the name “photo.jpg”.

9. All the settings for the selected camera can be reset to default values by pressing the “Reset Settings” button.
10. This section shows the image recorded by the 4K-miniCam under current settings. If the button indicated in figure 7 by the number 1 is pressed that this section fills the entire window.

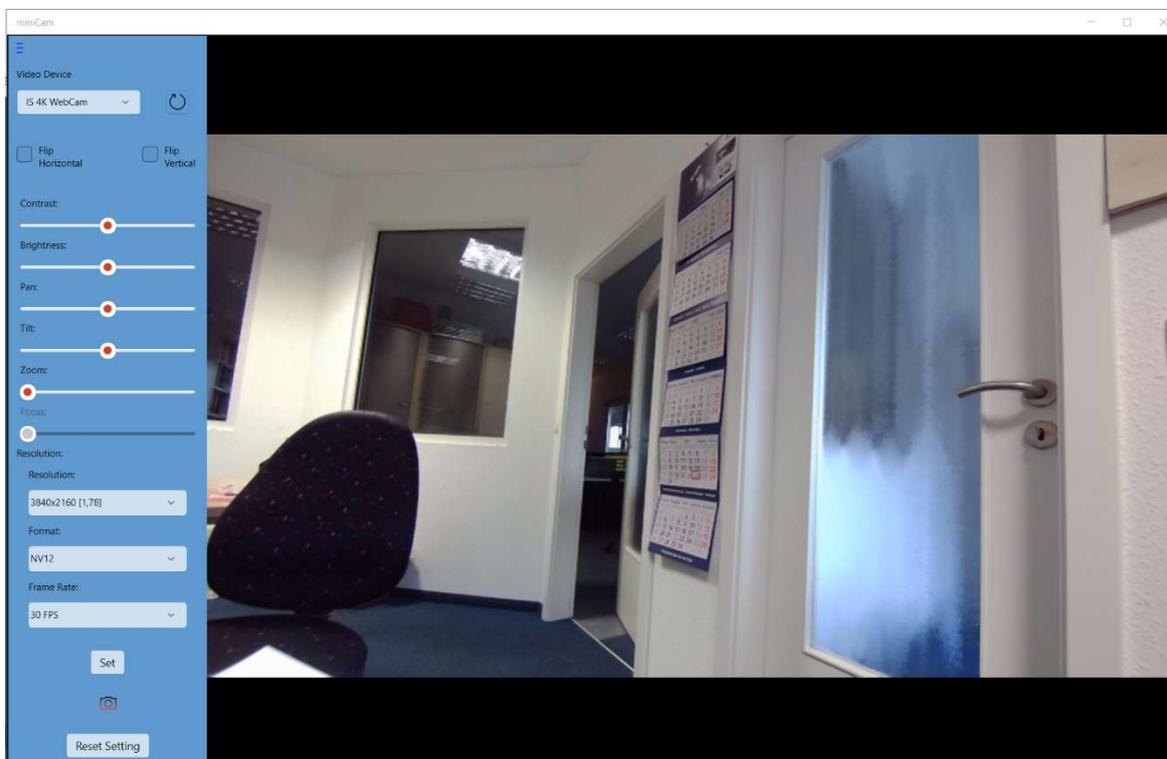


Figure 7: Software demonstration of the AVT miniCam for different settings

7. Operation of the miniCam-Pro Software (chargeable)

The miniCam-Pro software has all the functionalities of the basic miniCam software with many added functionalities. The installation of this software after purchase is done exactly like the installation of the free-of-charge version.

7.1 Main areas of the AVT miniCam-Pro software

The miniCam-Pro software interface has two main sections: “Home” and Setting”.

The “Setting” area contains all the camera settings that are very similar to the miniCam software. The difference is that, with the miniCam-Pro software, you can also change hue and white balance of the image (Figure 8, depend of MiniCam hardware).

On the other hand, the “Home” section contains the added functionality of the Pro version. You can detect movement, brightness change, color change etc. of certain area or the entire image area with different sensitivities. You can also save the files of the changes and document when the change was detected. Figure 9 shows the interface for the detection.

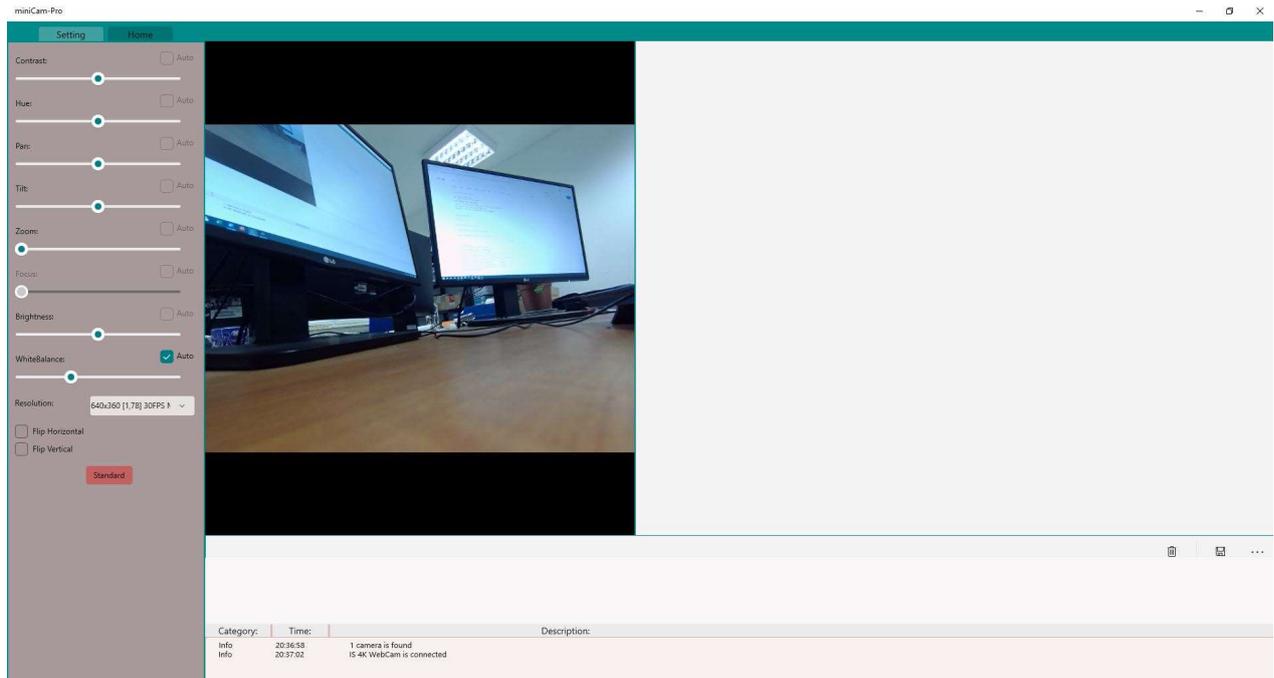


Figure 8: miniCam-Pro software different settings

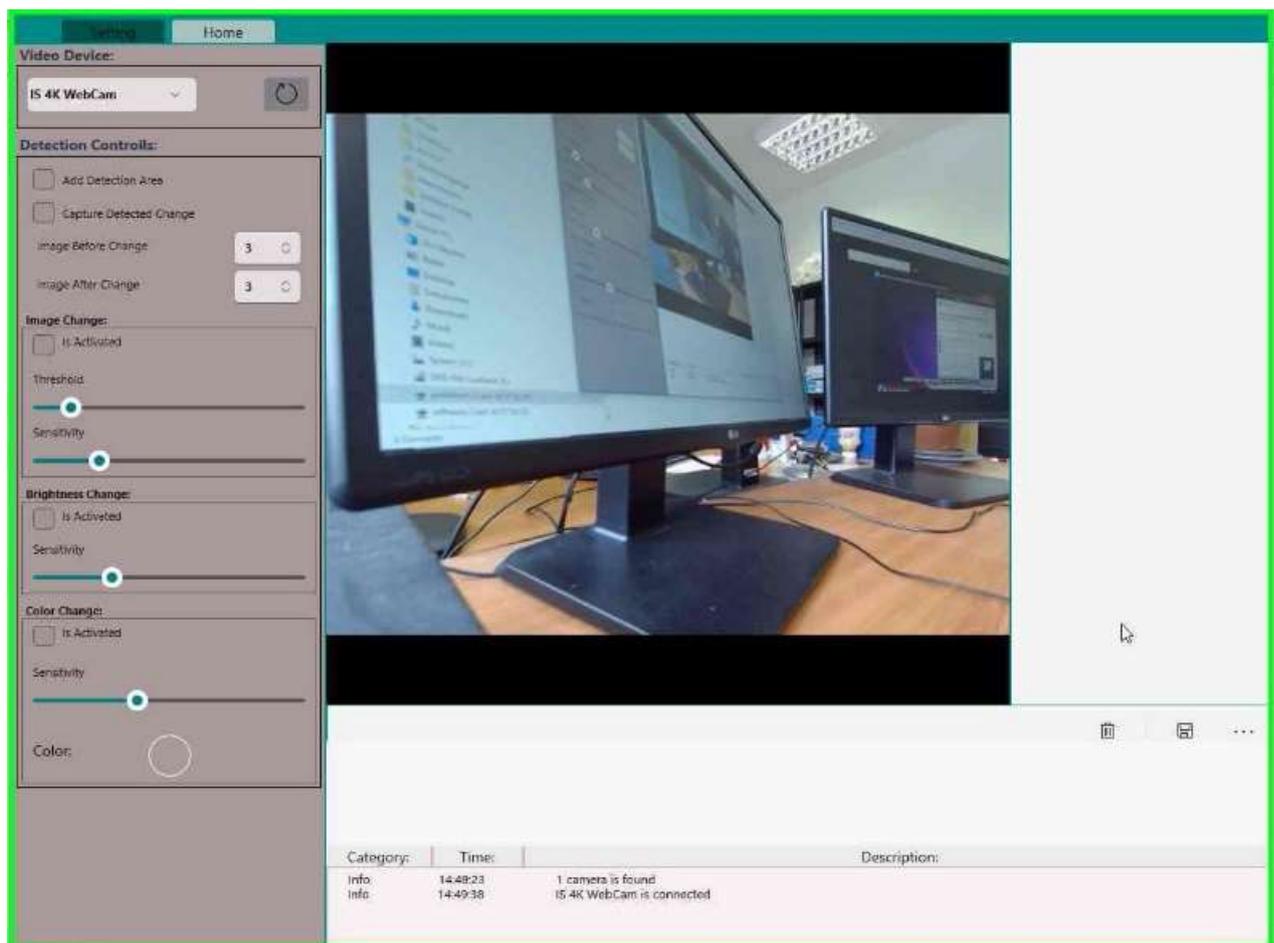


Figure 9: miniCam-Pro change detection section interface ("Home")

7.2 Change detection with miniCam-Pro software

1. Change in detection area: During camera operation, if you want to detect changes in a specific area, you can tick the “Add Detection Area” checkbox and mark out the area in which changes should be detected (mouse movement by pressed left button). Then you can check the box “Capture Detected Change” to start documenting the detections as well as capturing before and after pictures. If you want to detect changes in the entire picture uncheck the “Add Detection Area” checkbox (see Figure 11). Figure 10 shows an example where the detection area is selected (Red rectangle is drawn by the software). The change is detected based on brightness change of the detection area. If you look at the The grey oval area, you can see that a hand is entering into the detection area which changes the brightness. This has been detected by the software and shown below are images before and after the change. The number of these can be customized by changing the respective values in the textboxes below the checkboxes.

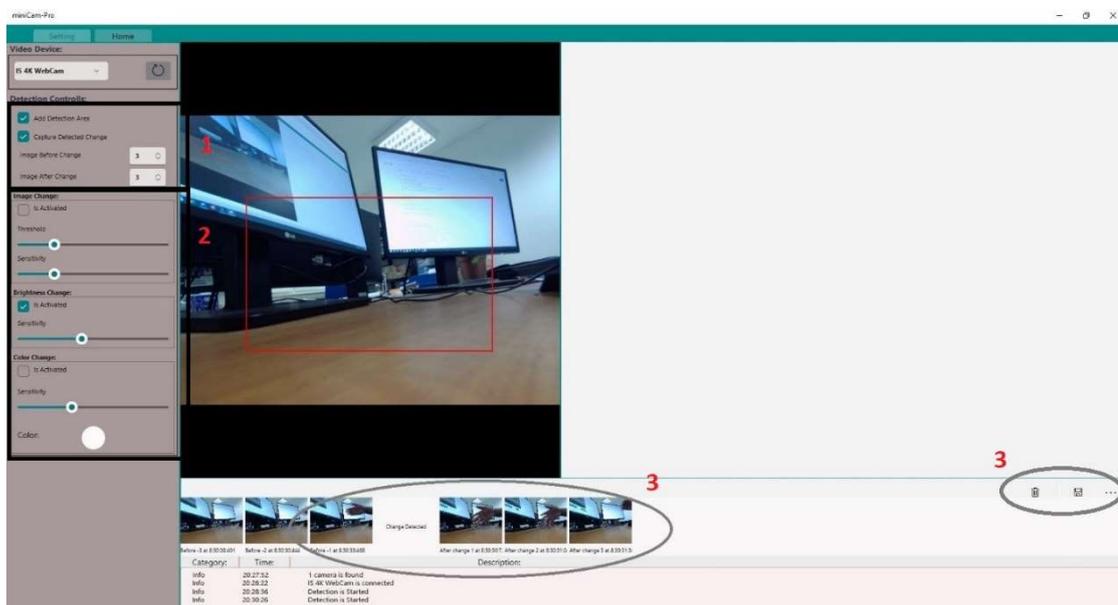


Figure 10: miniCam-Pro detection area brightness changed

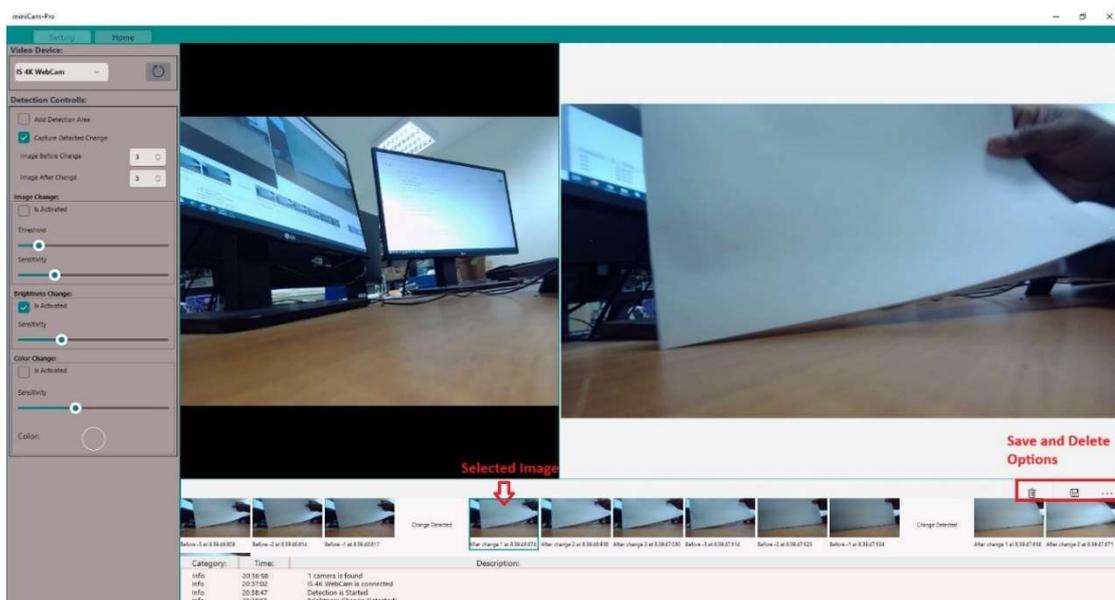


Figure 11: miniCam-Pro change detection before and after, individual images can be saved and deleted

- Here you can select a criterion for change detection. You can select one or multiple options of the following: Image Change, Brightness Change, Color Change. You select an option by checking the checkbox “is Activated” in the respective subsection. For each option there is a slider for controlling the sensitivity in detection. Additionally there is a threshold slider for “Image Change” and a color for comparison for “Color Change”.
- You can keep the “Is Activated” option checked and it will keep capturing more changes, as shown in Figure 12. You can select images and save them to your computer or delete them, by selecting the chosen image and clicking the respective Button. If you want to clear the image history just press the Delete Button without selecting an image.

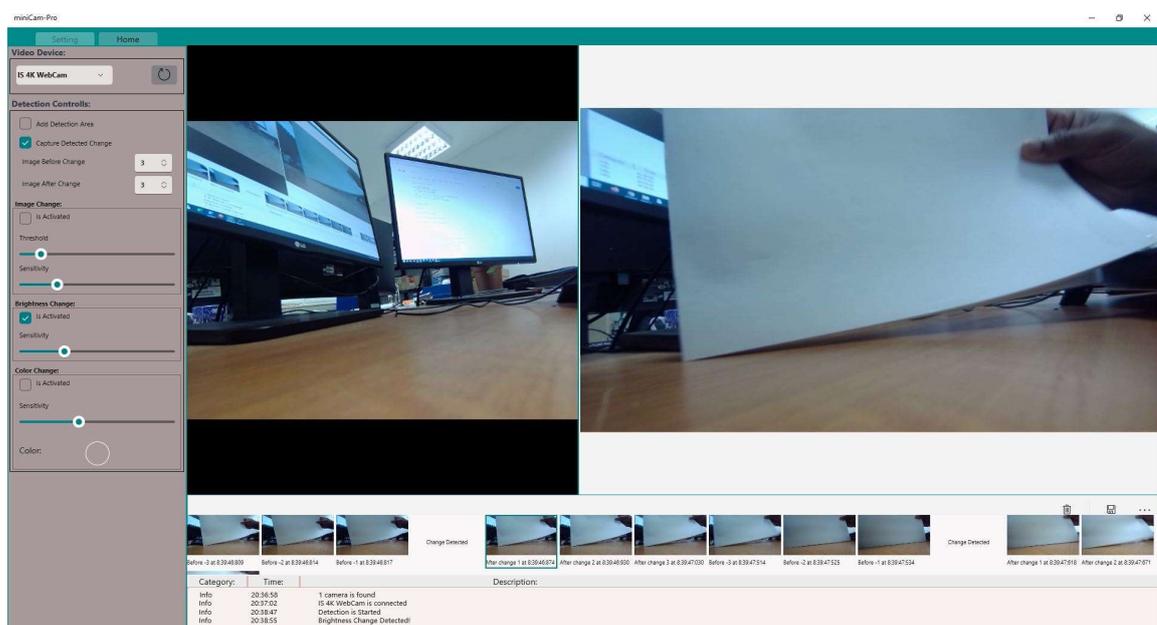


Figure 12: miniCam-Pro brightness change detection for entire image frame

- Below these Pictures you can see a Log of the events triggered, which you can use for analyzing your observations with specific timestamps.

Modification History

Version

1.00	Initial creation of the document (18.09.2023)
1.01	Extension of the document (04.10.2023)
1.02	Extension of the document (09.10.2023)

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Product website



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Errors and omissions excepted