



Manual

VisionDevice - IndustrialDashCam

Version 1.2 – January 2021

Contents

1	Handling and Safety Instructions	4
2	Introduction	5
2.1	Main features	6
3	Operating Conditions	7
4	Interfaces	8
4.1	Power and I/O	8
4.1.1	Digital I/Os	9
4.2	1000 Mbit/s Ethernet	10
4.3	Status LEDs	11
5	Adjusting the Focus (S-Mount)	12
6	Mechanical Drawings	14
6.1	S-Mount	14
6.2	C-Mount	15
7	Web Based Graphical User Interface (WebGUI)	16
7.1	Overview	16
7.2	Accessing the GUI	16
7.3	Welcome page	16
7.3.1	Indicator bar	18
7.3.2	Navigation panel	18
7.4	Event Log	19
7.5	View Live page	20
7.6	Configuration Page	22
7.6.1	Setting IP-address and Web-Service Port	23
7.6.2	Language and System Name	23
7.6.3	Camera Settings	24
7.6.4	Setting Area of Interest	25
7.6.5	Setting Encoder Bitrate and FPS	25
7.6.6	Setting Recording mode and video length	26
7.6.7	Set triggering options	26
7.7	View Video page	28

7.7.1	Viewing a video	28
7.7.2	Saving a video	29
7.8	About page	30
7.9	Exit page.....	31
8	Support	32
9	History.....	33

1 Handling and Safety Instructions



Depending on the operating conditions, the housing temperature can exceed 60 °C. There is a risk of injury!



Caution! LED risk group 2. Do not look directly into the LED flash!



EMC conformity according to EN/IEC 61000-6-2:2005 is qualified for cable lengths ≤ 30 m.



Electrical installation should be executed without power applied to the device and all connected devices.



Please take special note of the voltage range which may be applied to the device. Otherwise, permanent damage to the device may result!



Due to the characteristics and physical principles inside flash memory, **memory cards have a finite lifetime** dictated by the number of write operations. Therefore, take care of the regular write operations to prevent an early flash damage.

2 Introduction

Even in perfect machines, unwanted situations occur from time to time, which lead to machine downtime and thus to loss of production. It is crucial to know what exactly have led to the downtime for avoiding the sequence of events next time. Often, observing a working machine by a naked eye does not bring much due to the speed of the machine. Moreover, sometimes it is impossible or even dangerous. For such cases IMAGO has developed the VisionDevice – IndustrialDashCam (VD-IDC).

The IndustrialDashCam is a surveillance and remote monitoring camera for industrial environments in a match box form factor. The concept is similar to a dash-cam, adapted for industrial environments. IndustrialDashCam continuously monitors a scene without storing anything. Upon an event, which can be defined by the user, the IndustrialDashCam saves the video on to local storage media. The length of the video as well as its span in time before and after the event can be defined by user. There are three types of possible events: it can be a hardware trigger, absence of a heartbeat or changes in image. The IndustrialDashCam offers two digital inputs for the events. Furthermore, the IndustrialDashCam is equipped with a powerful internal LED lighting unit, which is perfect for difficult lighting conditions.

This document is the manual of the IndustrialDashCam. Hardware related aspects as well as the WebGUI operation are described.

2.1 Main features

- 21 - 28 V DC power supply
- Passive cooling without heat sink
- Image sensors:
 - 1920 × 1080 pixels
 - Global shutter
 - Monochrome or Color
- Lens:
 - S-Mount or C-Mount
- Internal LED lighting:
 - Controllable via software
 - Automatic current regulation
- Recording:
 - Web-GUI available via the IP-address of the device
 - File Format: MPEG4 (H.264)
 - Frame rate: FULL-HD: ≈ 60 fps (mono)
 VGA: ≈ 180 fps (mono)
 QVGA: ≈ 370 fps (mono)
 - Recording time: ≤ 20 s (past, future or a mix of both)
 - Mass storage ≥ 32 GB
 - Trigger Modes:
 - Regular: Video is recorded when the digital input signal raises
 - Heartbeat: Video is recorded when the Heartbeat signal is lost
 - Software: Recording is started after a threshold of change is reached within a ROI
 - Recording modes:
 - History: Video prior to the trigger event is saved
 - Future: Video after the trigger event is saved
 - Mixed: Video prior and after the trigger event is saved
- Digital inputs / outputs:
 - 4x digital output
 - 2x digital input
- Ethernet interface 1000 Mbit/s
- Housing:
 - 21 - 28 V_{DC} power supply
 - Passive cooling without heat sink

3 Operating Conditions

Power Supply:

Parameter	Min.	Typ.	Max.	Unit
Supply voltage	21	24	28	V
Supply current (@24V)			0.5	A

Digital Input:

Parameter	Min.	Typ.	Max.	Unit
Input voltage range	0		25	V
Rising edge threshold voltage	7.4		9.4	V
Falling edge threshold voltage	4.7		6.3	V
Input resistance		15.5		kΩ

Digital Output:

Parameter	Min.	Typ.	Max.	Unit
Output current			50	mA
Output high voltage		$V_{Supply} - 0.2$		V

Environment:

Parameter	Value	Unit
Weight, including cable	125	g
Operating temperature	5 ... 45	°C
Operating humidity, relative, non-condensing	5 ... 95	%
Storage temperature	-30 ... +70	°C
Storage humidity, relative, non-condensing	5 ... 95	%

4 Interfaces

4.1 Power and I/O

A non-shielded, 0.5 meter cable with an M12 8-pin connector is used for power supply and I/O signals.

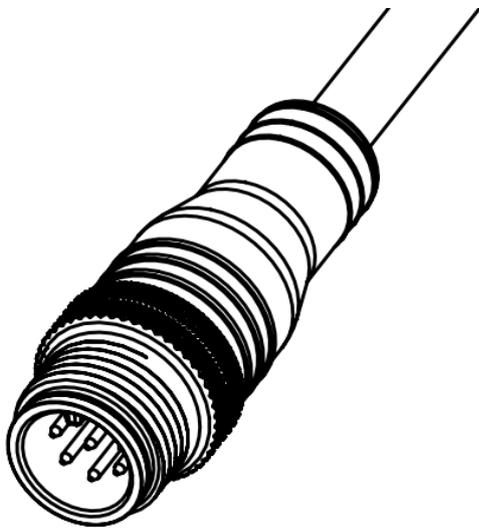


Figure 1: Power supply and I/O cable

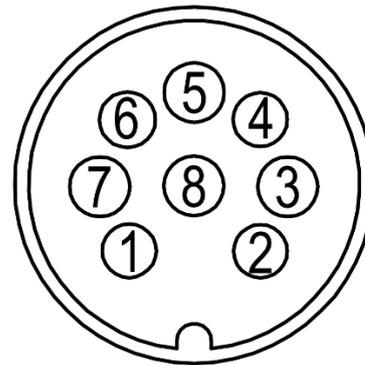


Figure 2: Pin assignment M12 connector

Pin	Function
1	Power (21V-28V)
2	GND
3	Digital IN0
4	Digital IN1
5	Digital OUT3
6	Digital OUT0
7	Digital OUT1
8	Digital OUT2

Table 1: Pin assignment M12 connector

4.1.1 Digital I/Os

The following illustration shows the electrical equivalent circuit for the digital input and output signals:

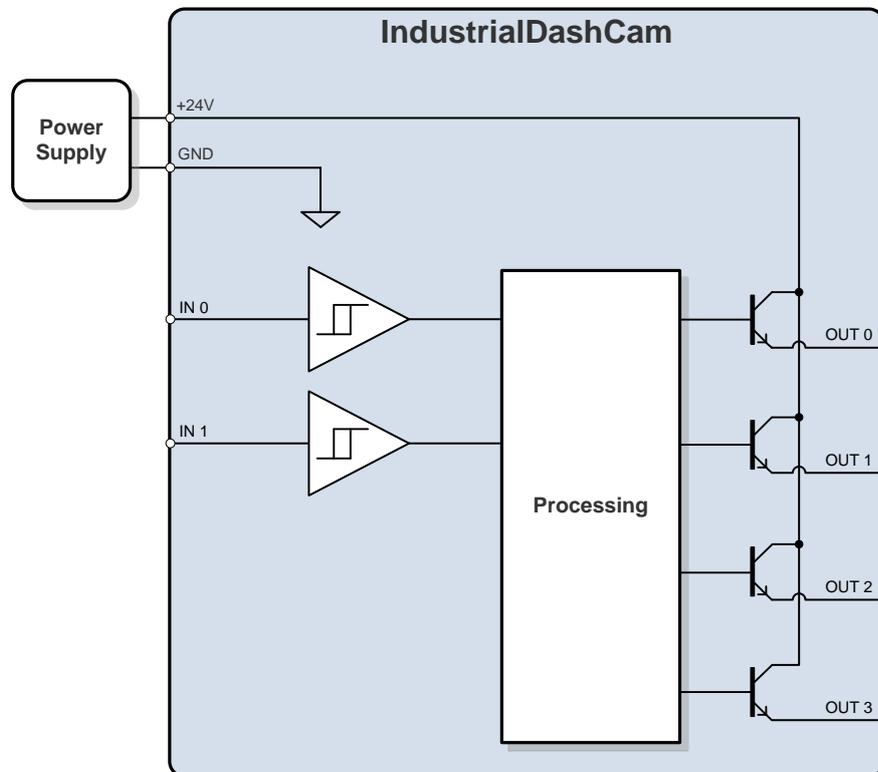


Figure 3: Simplified digital I/O circuit

The input signals use a Schmitt trigger circuit with the power supply GND as voltage reference.

The digital output circuit uses open-emitter configuration. All outputs are internally supplied by the 24V power input.

4.2 1000 Mbit/s Ethernet

A shielded 0.5 m Ethernet cable with a M12 8-pin X-coded connector is used for network communication.

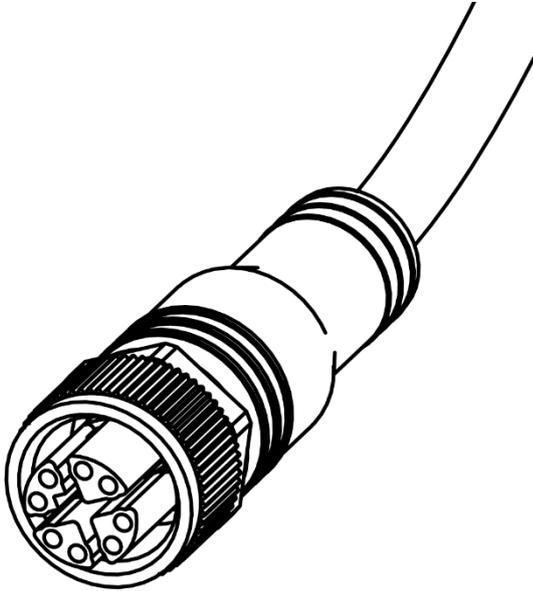


Figure 4: Ethernet cable

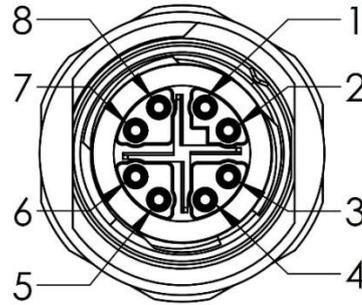


Figure 5: Pin assignment M12 connector

PIN	Function
1	D1+
2	D1-
3	D2+
4	D2-
5	D4+
6	D4-
7	D3-
8	D3+

Table 2: Pin assignment M12 connector

We recommend using shielded cables, for example:

Length	Product	IMAGO order code
1 m	Phoenix contact 1407471 "NBC-MSX/ 1,0-94F/R4AC SCO"	10007049
2 m	Phoenix contact 1407472 "NBC-MSX/ 2,0-94F/R4AC SCO"	10007050
5 m	Phoenix contact 1407473 "NBC-MSX/ 5,0-94F/R4AC SCO"	10008076

4.3 Status LEDs

The device is equipped with two status LEDs, namely “ETH” and “PWR”. The meaning of each status LED and its color is listed in the tables below.

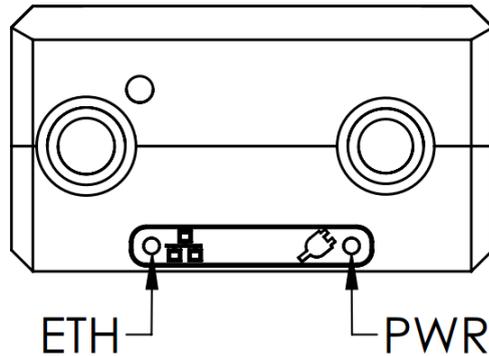


Figure 6: VisionDevice status LEDs

PWR LED	State
Green	Power on
Red	Digital IN0 signal active

Table 3: PWR LED states

ETH LED	State
Green	Ethernet link is up
Red	Ethernet activity

Table 4: ETH LED states

5 Adjusting the Focus (S-Mount)

To adjust the focus, you must first remove the hexagon socket set screw located on the back of the camera.

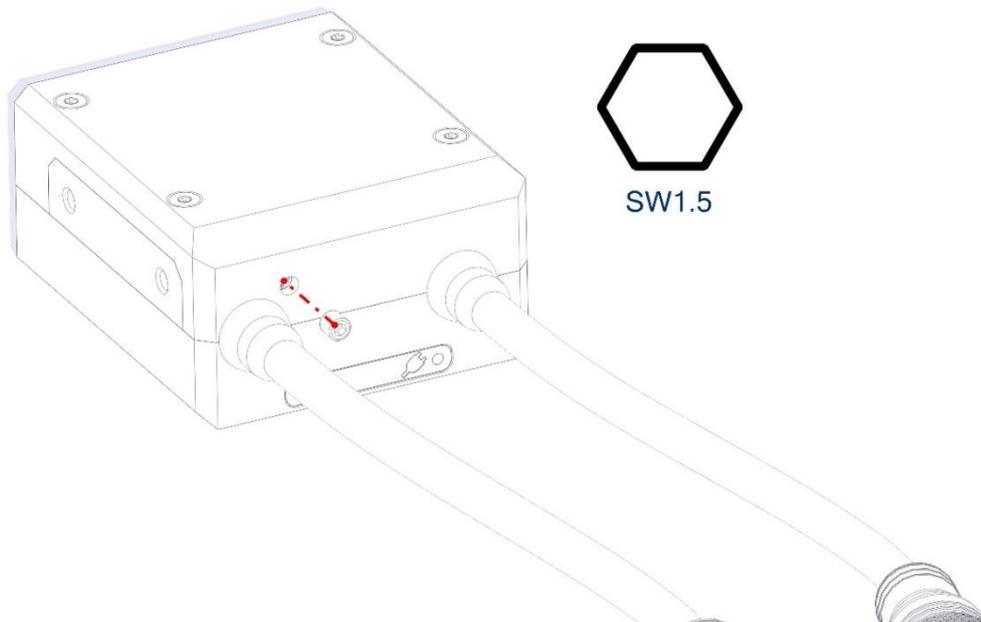


Figure 7: Removing the hexagon socket set screw

If you screw clockwise, the focusing plane will get closer to the camera.

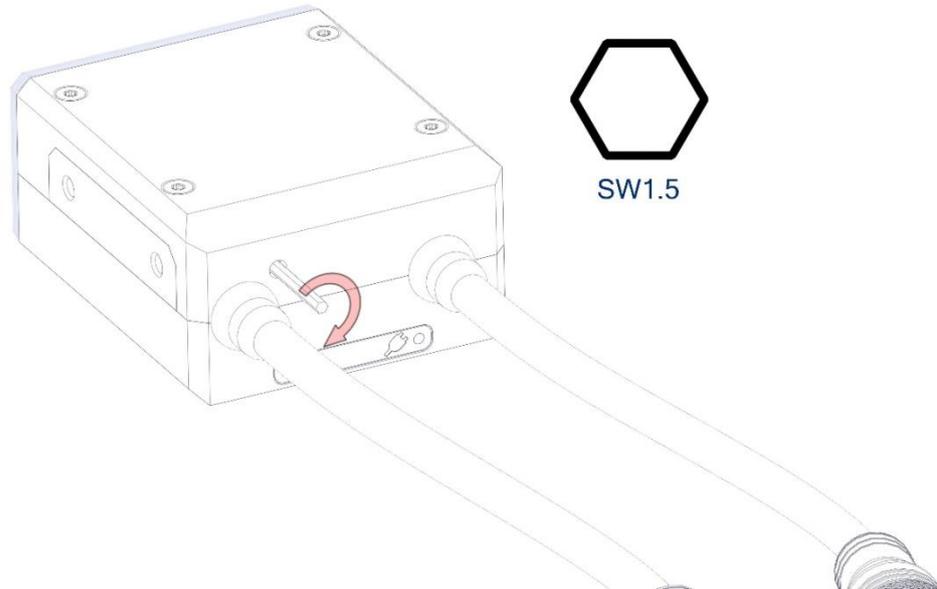


Figure 8: Adjusting the focus

If you screw counter-clockwise, the focusing plane will get more distant.

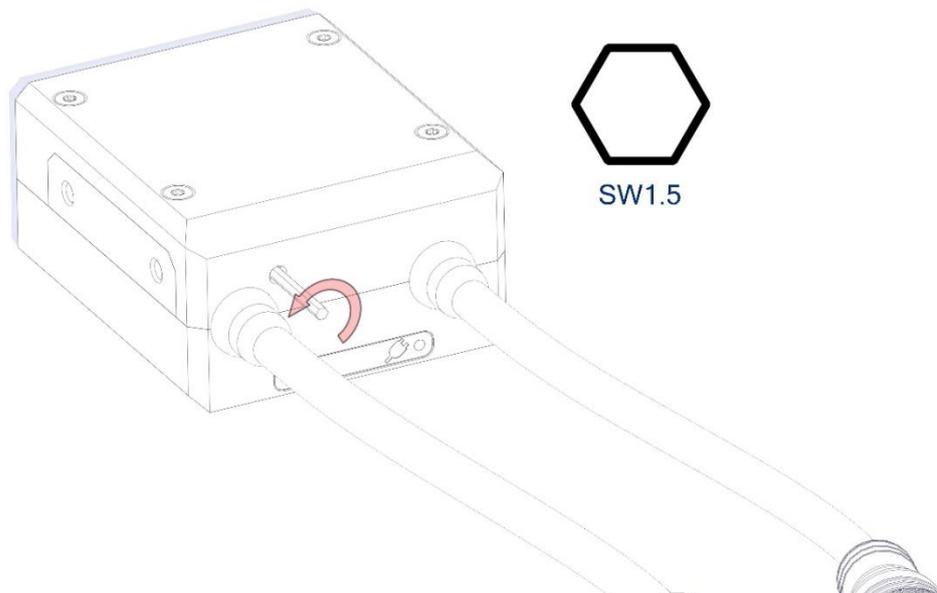
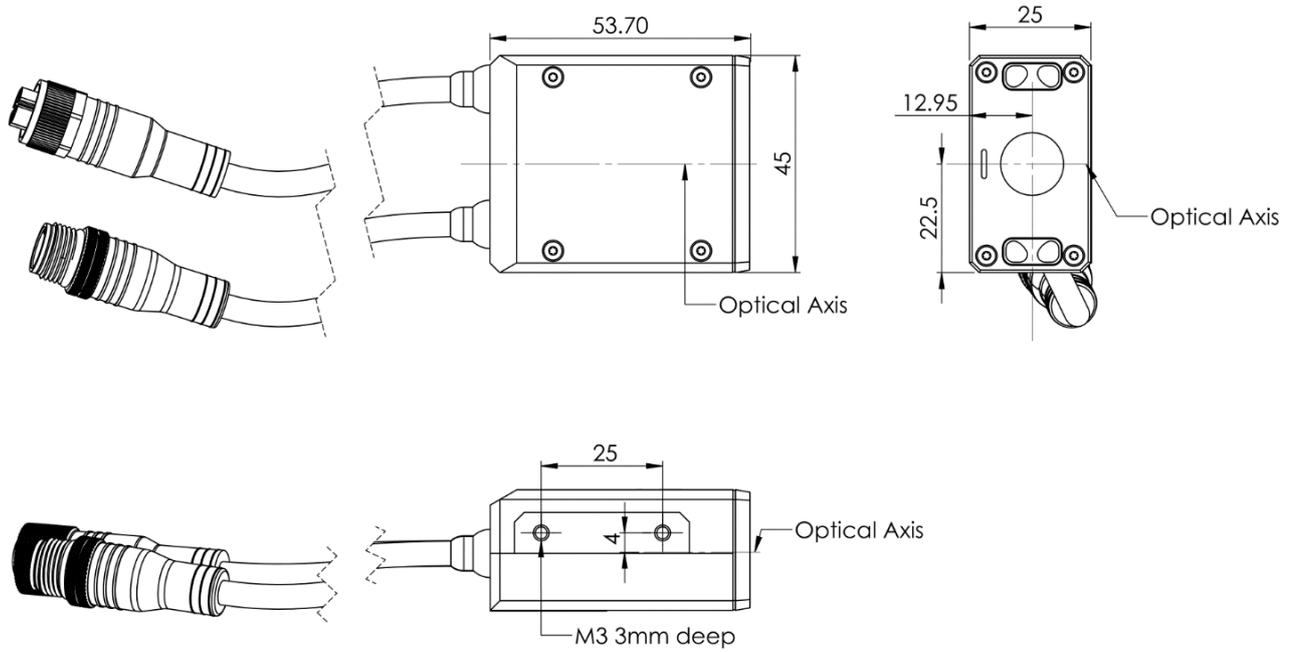


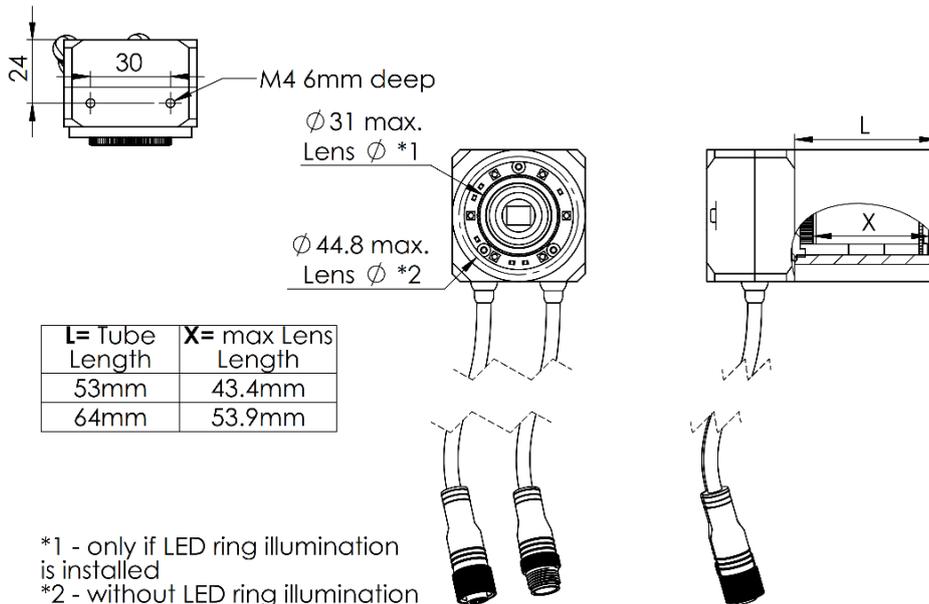
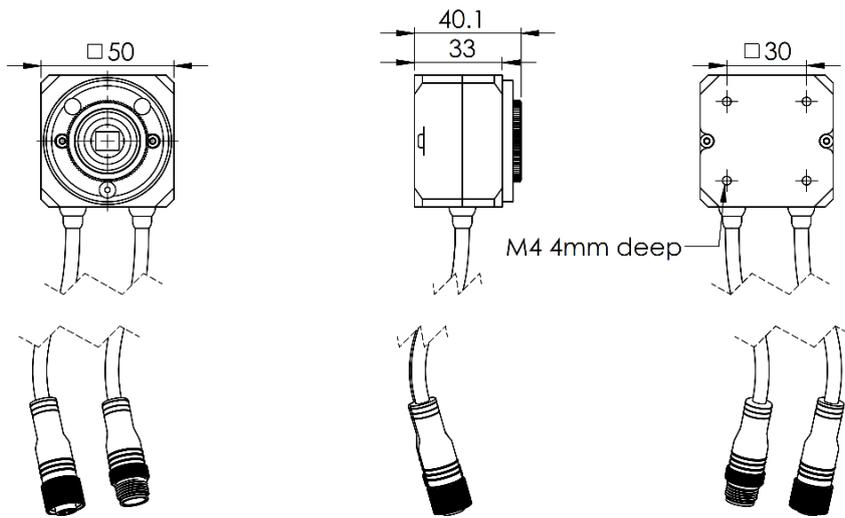
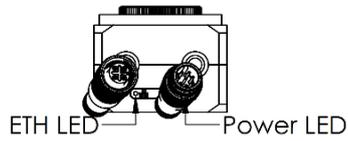
Figure 9: Adjusting the focus

6 Mechanical Drawings

6.1 S-Mount



6.2 C-Mount



7 Web Based Graphical User Interface (WebGUI)

7.1 Overview

In this chapter the operation of the IndustrialDashCam by means of the WebGUI are described. The GUI is a Web-based GUI, namely, it runs in an Internet-browser, for instance, Firefox, Microsoft Edge and so on. Thus, it is platform and operation system independent. WebGUI is operational as long as modern browser is supported.

The WebGUI has been designed with the universality as the basis idea combined with the minimal-ism concepts. Under “universality” the authors mean the possibility to use the interface in a laboratory where low level features and settings must be available and in a production line, where the functionality must be reduced to bare minimum. In addition to that, the “universality” refers to the possibility of using the interface on devices, which do and do not support touch input.

The IndustrialDashCam operation is independent from the WebGUI, namely the VD-IDC keeps operating even if the WebGUI is closed.

7.2 Accessing the GUI

The GUI is accessible from a browser running on a PC or a laptop. The PC or laptop must be connected to the same network (also logical, not only physical) as the IndustrialDashCam. IP-address or the serial number of the IndustrialDashCam is used for accessing the WebGUI. IP-address is entered into the address-line of the browser. Alternatively, the serial number can be used. The user should enter the serial number in the address line of the browser omitting the dashes and append “.local” to it. For example, assuming the serial number on the device is “VSPV-3003-100001”, the following should be entered into the browsers address line “VSPV3003100001.local”.

7.3 Welcome page

Welcome page is the first page shown to the user on the startup of the IndustrialDashCam’s WebGUI. Welcome page contains the Indicator bar and the Navigation panel (Menu). The latter can be placed on the left, as presented on Figure 10, or on the right side. Indicator bar is always located on the bottom of the page and contains most used information about IndustrialDashCam.

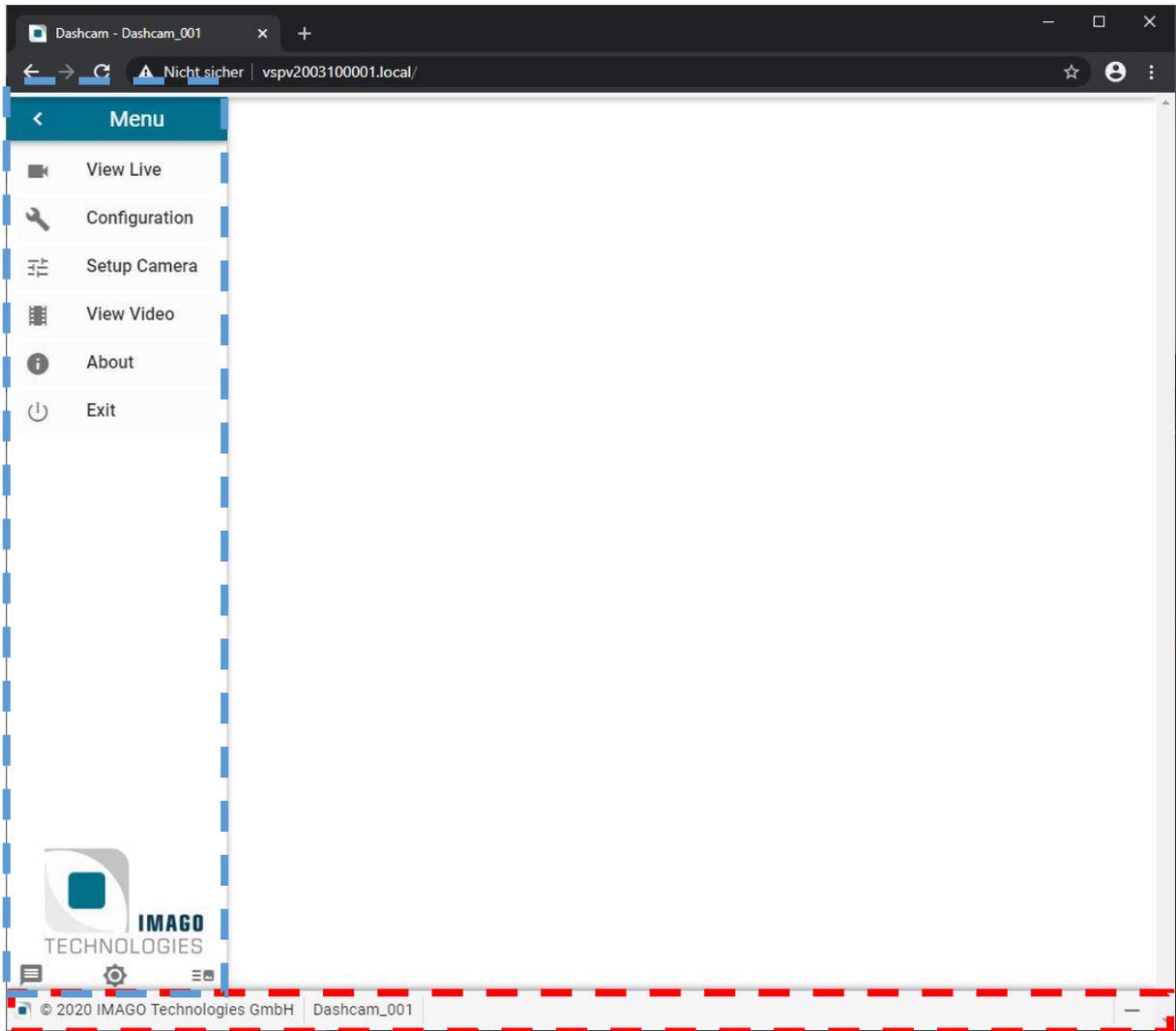


Figure 10: Welcome page. Navigation panel on the left (marked with dashed blue line); Indicator bar on the bottom (marked with red dashed line).

7.3.1 Indicator bar

Indicator bar contains several indicators, see Figure 11.

There are indicators for the following information:

1. IMAGO Technologies Copyright note
2. Name of the system (can be changed on the Configuration page).
3. "Saving in progress" indicator.

The indicators are numbered in Figure 11, the numbers correspond to the list above. When placing a mouse cursor above an indicator a description of its function will appear in a pop-up blob.



Figure 11: Indicator bar. The name of the IndustrialDashCam is "Dashcam_001", as indicated by 2. The video saving is currently not in progress otherwise an icon of a diskette would be shown at 3.

7.3.2 Navigation panel

Navigation panel consists of the buttons for accessing the functions of the IndustrialDashCam, setting the appearance of the GUI and displaying the Event Log.

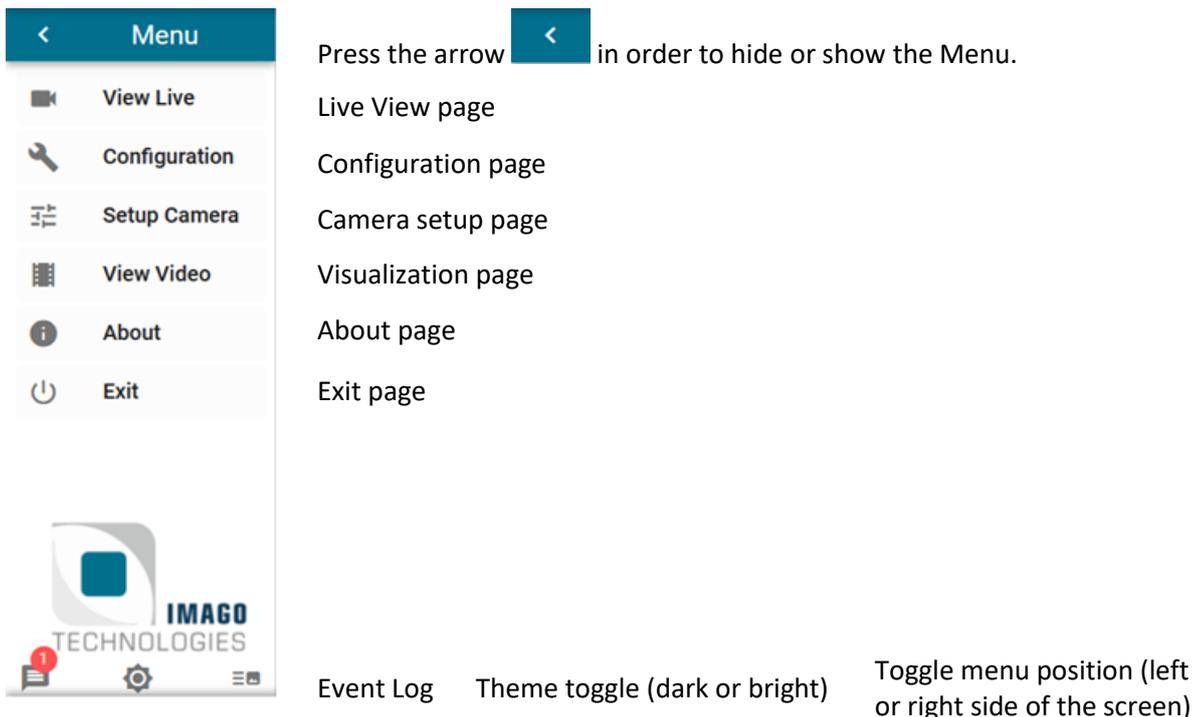


Figure 12: Navigation panel in the full state with the function of the buttons.

7.4 Event Log

Event log contains the messages of the IndustrialDashCam, such as error messages etc. It is hidden by default, see Figure 12. In case of any error messages the button will show the number of unread messages in a red circle. Once the button is clicked all the messages are marked as read and remain in the Event Log, see Figure 13.

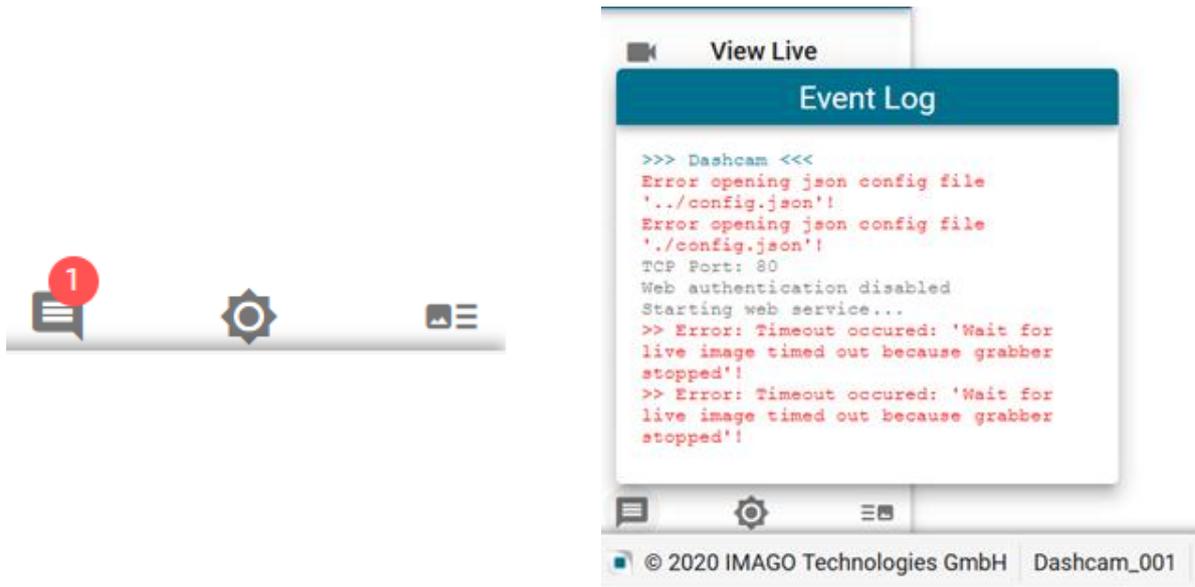


Figure 13: Left, Event Log button indicating one error. Right, Example of the Event log with an error

7.5 View Live page

View live page is for visualizing the image the IndustrialDashCam is acquiring. This page should be used for setting focus, choosing field of view and so on.

For starting the acquisition “Start” button, located at the bottom of the page, should be pressed. Stopping the acquisition is performed by means of the “Stop” button. During the acquisition the “Start” button is grayed out and vice versa the “Stop” button is grayed out when the acquisition is not running, see Figure 14. Note, that when the View Live is active, all of the other buttons are grayed out. In order to return onto the Welcome page, the “Back” button must be pressed.

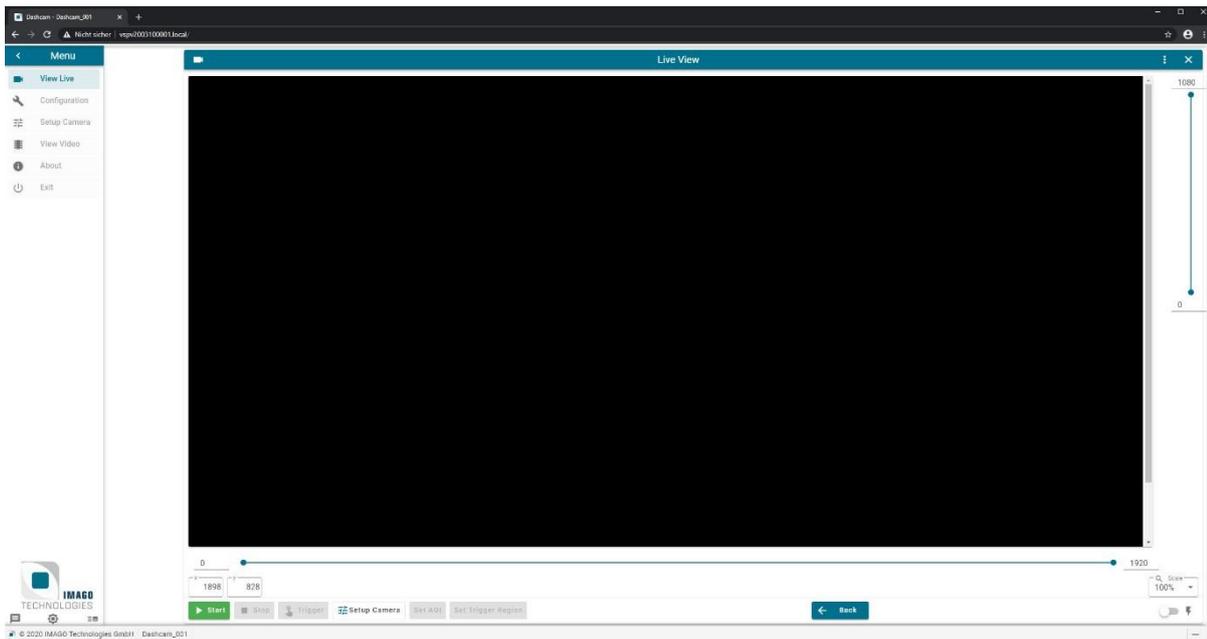


Figure 14: View Live page. This shows the live view while no acquisition is running. Mouse cursor position is indicated in “x” and “y” text fields.

By pressing the “Trigger” button a software trigger event can be generated, and the video will be recorded according to the Recording mode set by the user. Text fields “x” and “y” are indicating the mouse cursor position in image-related coordinate system. The scale can be selected in the drop-down list in the right-bottom corner. “Setup Camera” button opens the Camera setting dialog, which is also available via the Configuration page. The dialog is for adjusting acquisition parameter, in contrast to the IndustrialDashCam parameters as Recording mode, Trigger event types and others. The dialog allows adjusting exposure time, gain, gain per channel (in case of the Bayer sensor) and the black level. While acquisition is running, the user can change the area of interest with the sliders below and right of the image. To make the selected area take effect, press the “Set AOI” button. For the IndustrialDashCams equipped with a strobe, it also provides the corresponding control. Setting a long exposure time might lead to decrease of the acquisition framerate, therefore please consider opening the aperture or bringing more light into the scene.

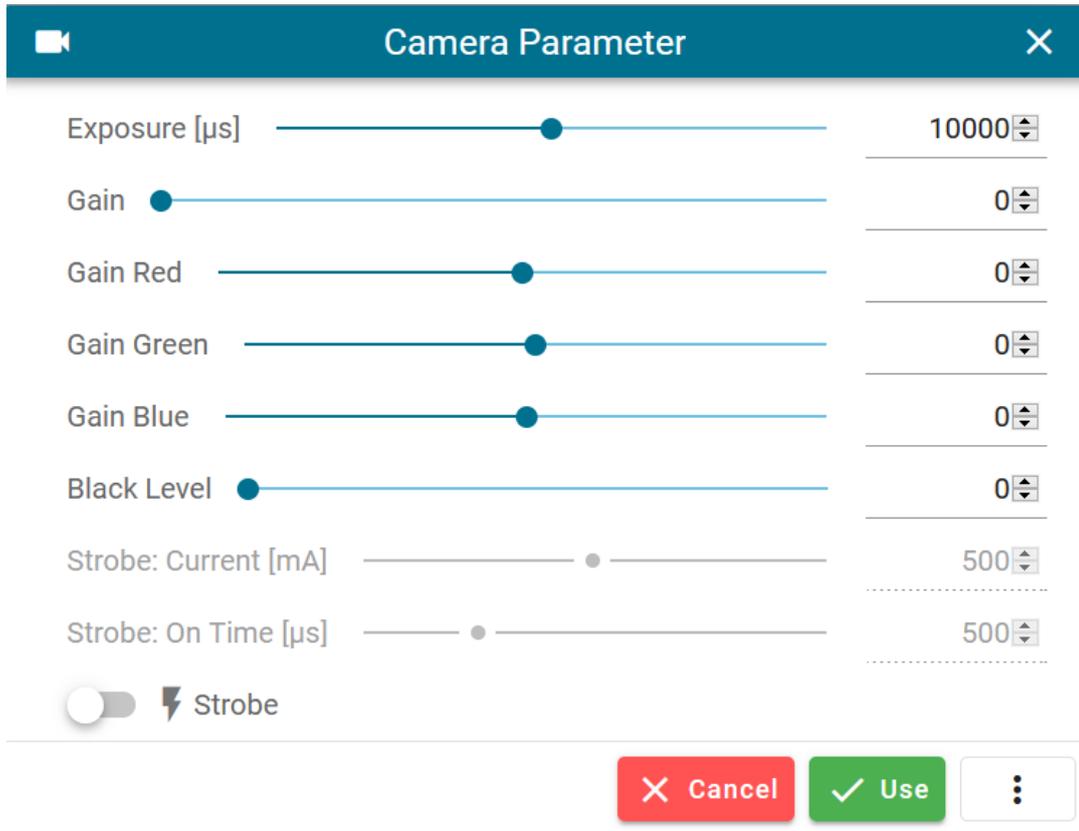


Figure 15: Camera parameter dialog.

All the settings can be saved or loaded by hovering  button and choosing “Save” or “Load” from the drop-down menu. The settings are applied only after pressing the “Use” button. Pressing the “Cancel” or “X” button results in closing the dialog.

7.6 Configuration Page

The Configuration page is a service page containing the hardware related settings, which consists of four tabs: “General”, “Camera”, “Dashcam” and “Triggering”, see Figure 16. The Configuration page is blocking, thus clicking outside the page will close it, as well as pressing “X” or “Cancel” button. All the settings can

be saved or loaded by pressing  button and choosing “Save” or “Load” from the drop-down menu. The settings are applied only after pressing the “Use” button, some settings might require restart of the application or even reboot of the whole system.

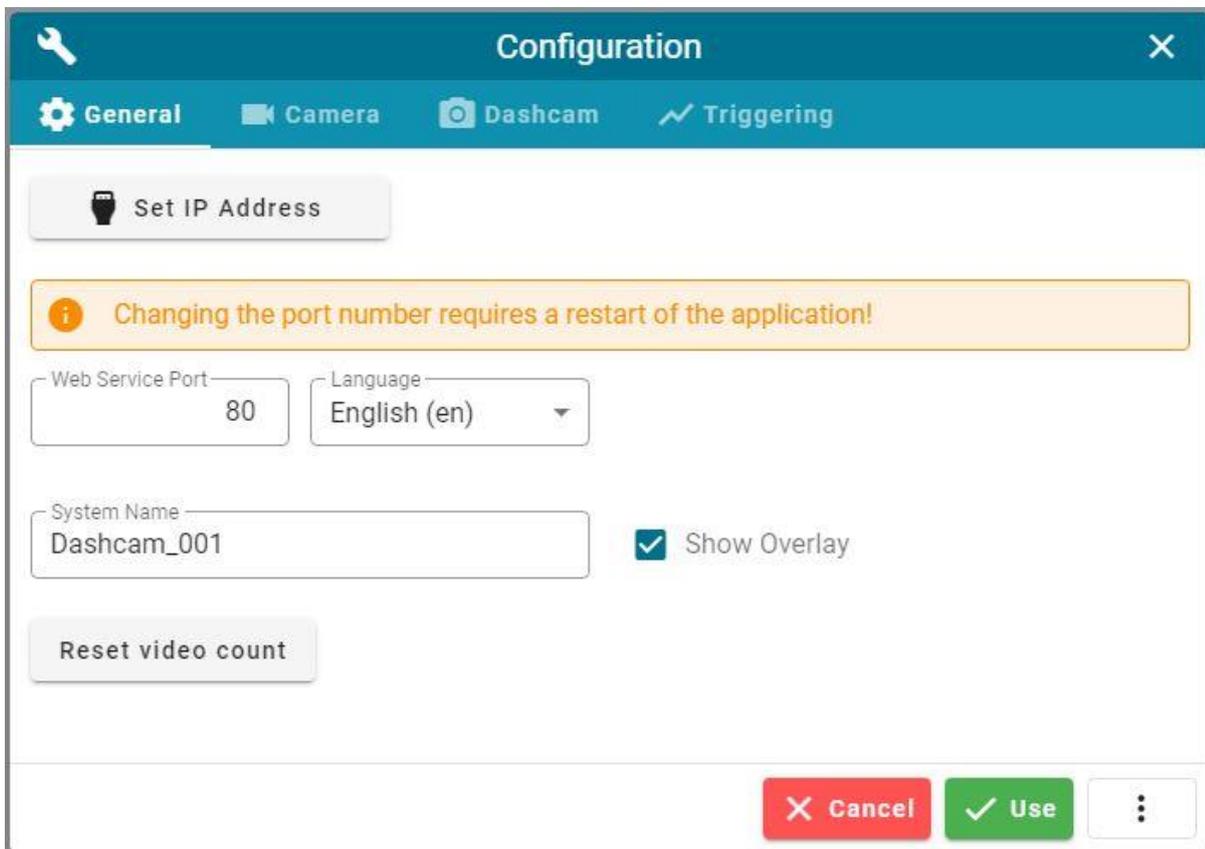


Figure 16: Configuration page and three tabs, the “General” is selected

7.6.1 Setting IP-address and Web-Service Port

By default, an IndustrialDashCam device is configured for getting IP-address via DHCP. It is possible to assign a static IP-address and the gateway address to the device from the WebGUI. In order to perform this operation, press the “Set IP Address” button on the “General” tab, see Figure 16. The “Set IP Address” dialog will show up. Pay attention to the warnings below the text fields. Enter the IP-address and the gateway address and press “Set” button. For the changes to take place the IndustrialDashCam must be rebooted. This can be done on the Exit page.

Note, that after changing the IP-address of the IndustrialDashCam and rebooting, the WebGUI will be accessible under different IP-address. Please make sure to update the address in the browser address field. Accessing the WebGUI by serial number is not affected with change of IP address.

Web service port field specifies the TCP-IP port where the WebGUI is accessible. Default value used by a browser is 80. If the port is set to any other value then the port must be specified in the address line after the IP-address, with a colon as a separation mark. For instance, the port is set to 8945 and the IP-address is 192.152.132.122, then the line entered to access the WebGUI is “192.152.132.122:8945”. Additionally, pay attention to the warning displayed above the text field. In order for the port changes to take place the application must be restarted.

7.6.2 Language and System Name

In the Language drop-down menu interface language can be chosen, the default value is English. There are two languages available at the moment: English and German. System name is displayed in the Indicator panel, see Welcome page chapter. This feature helps to distinguish between the interface of different systems, when several IndustrialDashCams are connected to the same network. Enter desired name into the “System Name” test field and press “Use” button.

The System name can also be used as overlay on the image, for that make sure the “Show Overlay” checkbox is checked and press the “Use” button. Note, that overlay will only be available on the videos recorded after the button “Use” is pressed. Already recorded videos though being on the IndustrialDashCam’s SD-card remain unchanged.

Last but not least, the user can reset the counting up number within the naming of the video files by pressing “Reset video count” on the general configuration page.

7.6.3 Camera Settings

Most settings like exposure time, gain, gain per channel and others can be set via the Camera Parameter dialog, see Figure 15 and refer to the View Live page section for more details on this dialog. The check box “Debayer” is now reserved for the IndustrialDashCam with Bayer filters.

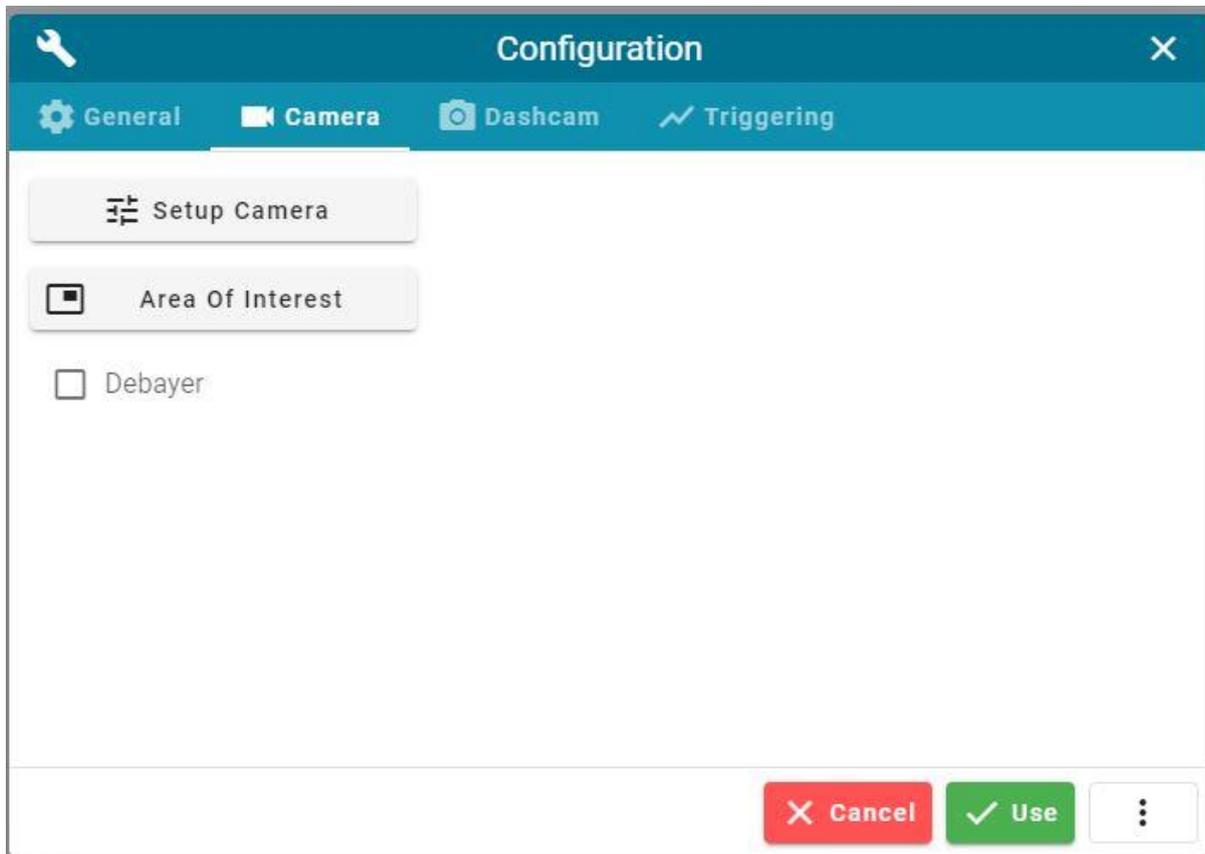


Figure 17: Configuration page and three tabs, the “Camera” is selected

7.6.4 Setting Area of Interest

All the acquisition-related settings are collected on the “Camera” tab of the Configuration page, see Figure 17. Pressing “Area Of Interest” button open the dialog which allows freely selecting the area of interest, see Figure 18. An area of interest has rectangular shape. The corners coordinates are specified in text fields “Top”, “Left”, “Bottom” and “Right”. “Top” and “Left” for the top-left corner while “Bottom” and “Right” are for the bottom-right corner. All coordinates are given in pixels, the size of the rectangle is displayed in bottom-left corner of the dialog. Changes in any text field take place upon pressing the “Use” button. The largest possible area of interest can be set by pressing “Maximize” button and confirming the choice with the “Use” button.



Figure 18: Area of Interest dialog.

7.6.5 Setting Encoder Bitrate and FPS

The Dashcam tab also allows specifying the encoder bitrate. Bitrate is specified in kb per second and can be chosen freely within the range from 10 kbps to 40 Mbps. Encoder bitrate trades off video quality to the compression speed and size of the video.

Further the desired framerate can be set by FPS slider. The available framerates are chosen to match acquisition and compression framerate.

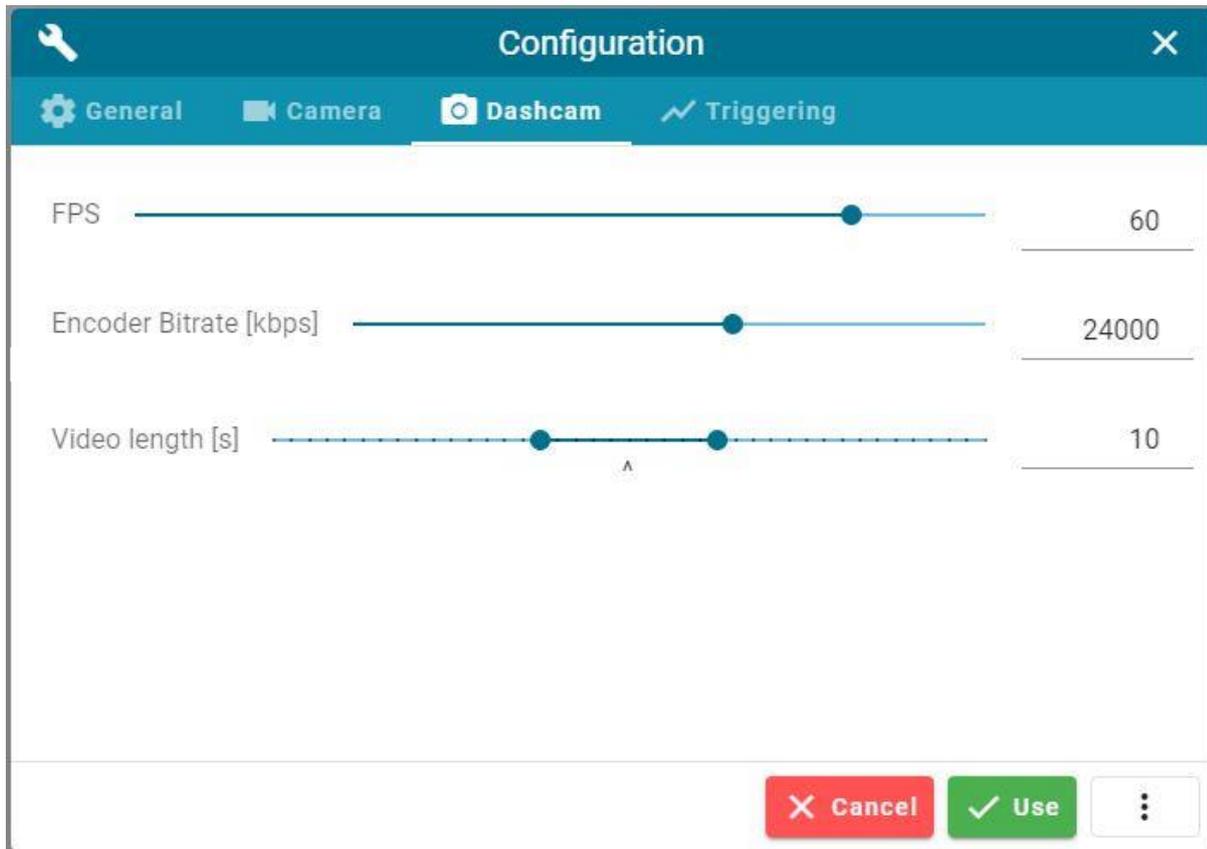


Figure 19: Configuration page and three tabs, the “Dashcam” is selected

7.6.6 Setting Recording mode and video length

The Recording mode can be selected by positioning the “Video length” range sliders. The arrow in the middle represents the trigger point. The two slider points are used to adjust the video length and how the video is positioned around the trigger point. The left side represents the history part and the right the future part. By knowing this, setting the right slider to the trigger point the history mode will be used. On the other hand, setting the left slider to the trigger point future mode is used. When none is at the trigger point mixed mode is used. The distance between the two slider points is the resulting video length, which is shown in the text field at the end of the slider. Note that the video length cannot exceed 20 seconds and may not be shorter than 2 seconds. Like all other settings, the change of the mode takes place upon pressing the “Use” button.

7.6.7 Set triggering options

The last tab allows the user to set various trigger options. First, the external hardware trigger pin can be selected within the dropdown. How this hardware trigger is handled can be chosen with the *Heartbeat Trigger* switch to the right of the dropdown. When inactive, the regular trigger mode is used. This means that a video is triggered whenever a high signal is received. When active, the signal is used as a heartbeat and thus only when no signal is received for a set time a video is saved. The text on the right of the switch always shows the currently active mode.

If the heartbeat trigger is set, the corresponding input field will be enabled. Here, the user can define a timeout in milliseconds. So that time defines the maximum time between two pulses. In case of a pulse does not occur, the dashcam starts recording.

If the *AutoTrigger* setting is activated, the corresponding input fields “Area of Triggering”, “Bias” and “Min Events” are enabled. When clicking the button “Area of Triggering” a new dialog opens for setting the Triggering Area. Do not confuse this area with the camera area! The Triggering Area must be within the Area of Interest of the camera. Every time a new Triggering Area is set, a check is performed evaluating whether the new Triggering Area parameters are okay. A feedback message is displayed. The general input handling is already described by section “Setting Area of Interest” above.

The Bias parameter describes the sensitivity threshold for detecting changes between images. These changes are called events. If the entire number of events exceeds the minimum number defined by the second field, a video record is triggered. The Min Events field is set in percentage relative to the Triggering Area size. Typical range values are:

- Bias 30 - 150
- Min Events 5 – 50%

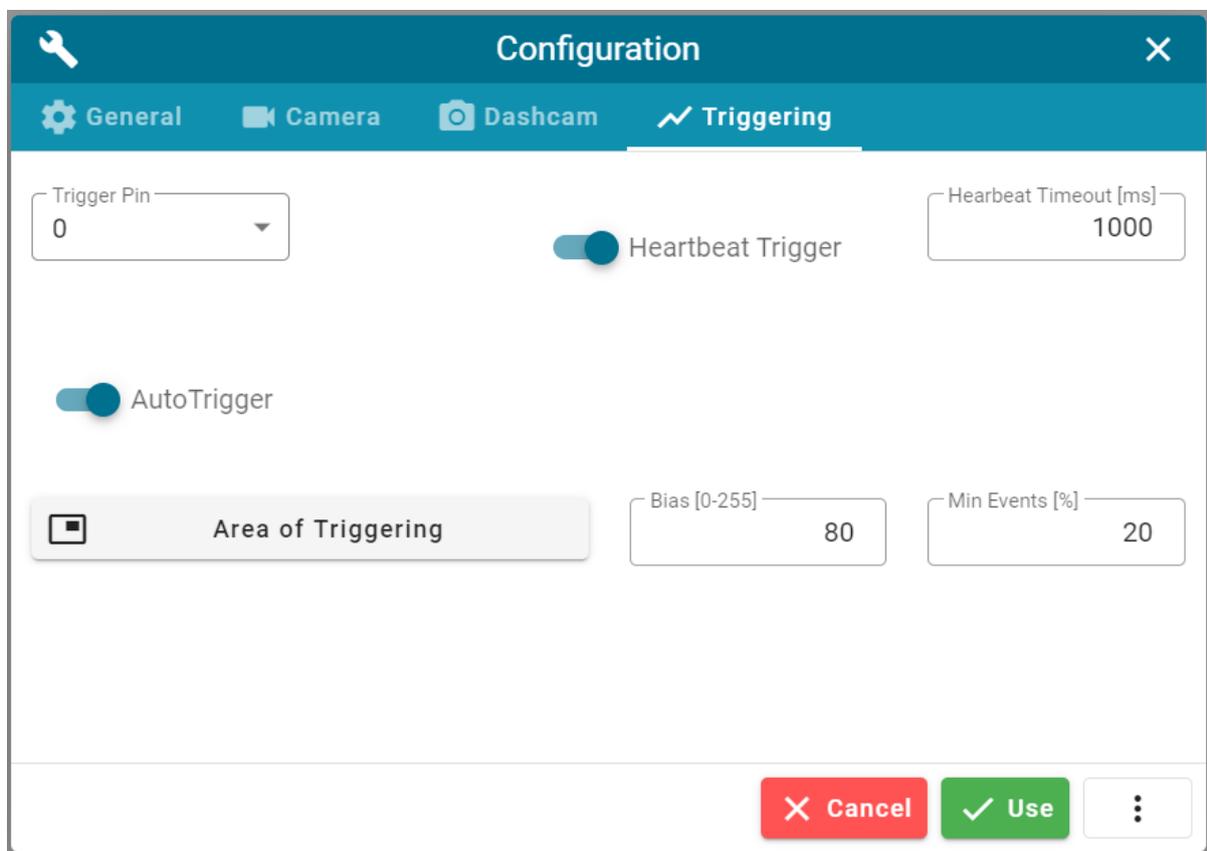


Figure 20 Triggers tab of configuration page

7.7 View Video page

7.7.1 Viewing a video

View Video page is for previewing a selected video, see Figure 21. In order to view the video, select one from the list and press “Load” button. Web-based video player will open, see Figure 22. Press the play button in order to start the playback or “Back” button in order to return to the Welcome page.

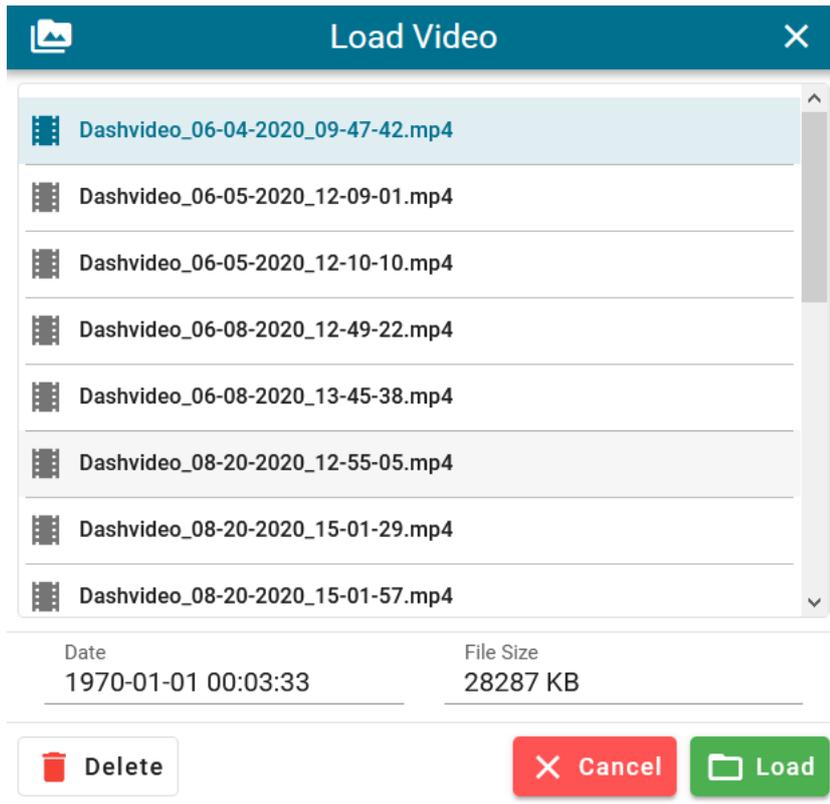


Figure 21: Video selection dialog.

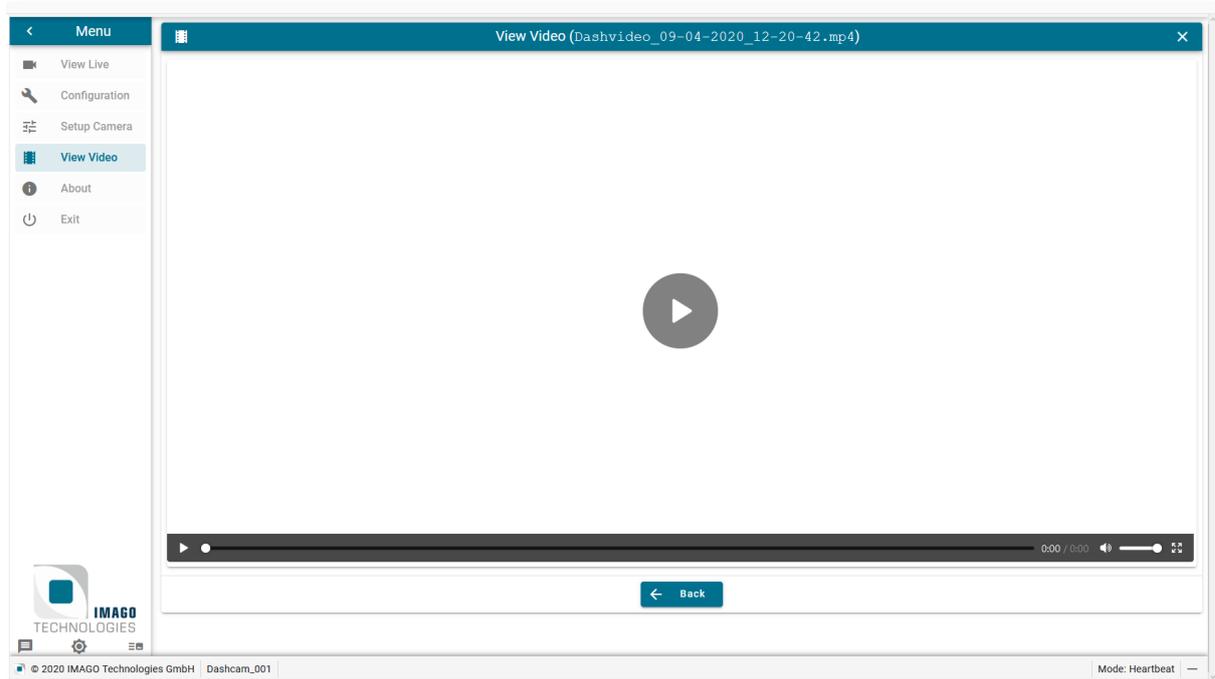


Figure 22: Web-based video player

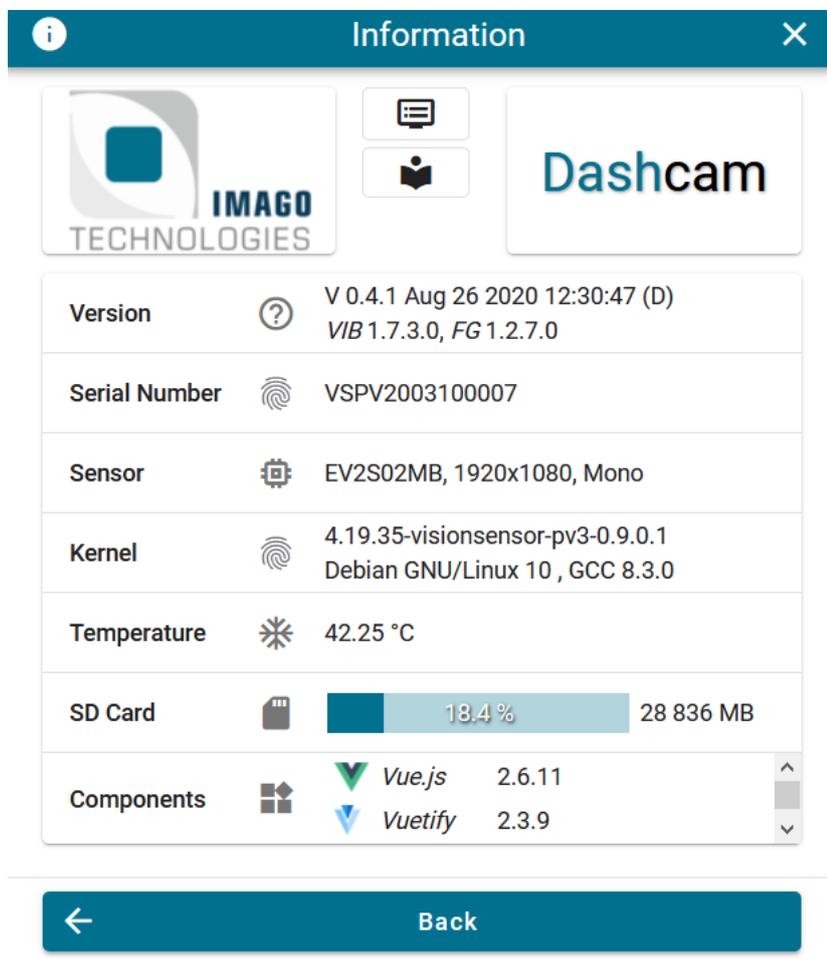
7.7.2 Saving a video

In order to save a video right-click on it and select “Save video” (exact wording might differ) from the context menu. Another way of saving videos is by clicking the IMAGO logo on the Navigation panel, selecting “Video” directory by clicking the corresponding link, after that simply right-click the video and select “Save video” from the context menu.

7.8 About page

About page contains various information about IndustrialDashCam, see figure below. The information includes (top-down in the list):

1. Version the software and the VIB-library.
2. Operation system version.
3. Serial number of the IndustrialDashCam.
4. Sensor resolution.
5. Current IP-address.
6. Temperature.
7. Free space on the SD-card.



The screenshot shows a mobile-style web interface with a teal header bar containing an information icon and a close button. The main content area is titled 'Information' and features the IMAGO TECHNOLOGIES logo on the left and 'Dashcam' on the right. Below this is a list of system information items, each with an icon and a value:

- Version:** V 0.4.1 Aug 26 2020 12:30:47 (D) VIB 1.7.3.0, FG 1.2.7.0
- Serial Number:** VSPV2003100007
- Sensor:** EV2S02MB, 1920x1080, Mono
- Kernel:** 4.19.35-visionsensor-pv3-0.9.0.1 Debian GNU/Linux 10 , GCC 8.3.0
- Temperature:** 42.25 °C
- SD Card:** 18.4% (with a progress bar) 28 836 MB
- Components:**
 - Vue.js 2.6.11
 - Vuetify 2.3.9

At the bottom of the page is a teal bar with a back arrow and the text 'Back'.

7.9 Exit page

Exit page allows closing GUI, rebooting the IndustrialDashCam, restarting the software and shutting down the system, see Figure 23.

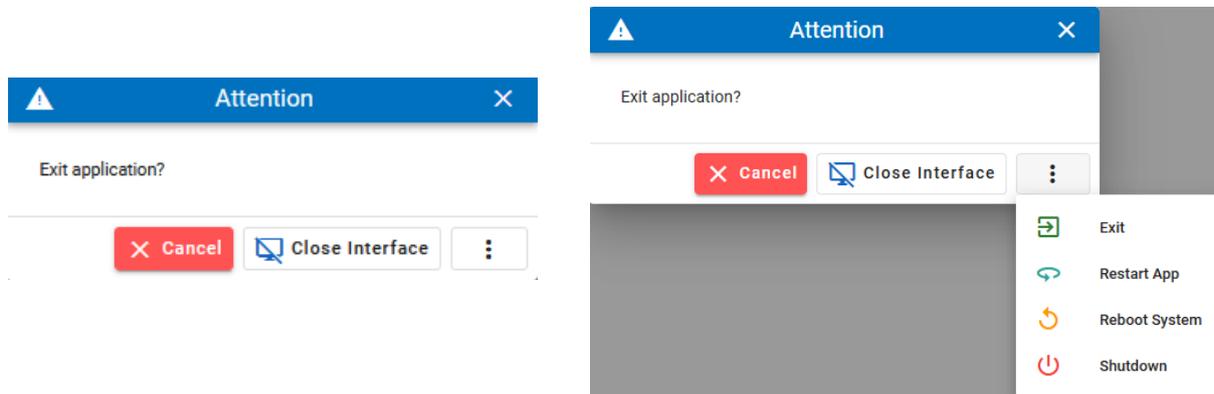


Figure 23: Exit page, left. Exit page, with the menu open, right.

“Close Interface” button allows closing the GUI. This will release the IndustrialDashCam to regular functionality.

“Exit” button in the menu shuts down the software but does not power down the hardware part of IndustrialDashCam.

“Restart App” button in the menu restarts only the software of IndustrialDashCam.

“Reboot System” button in the menu reboots the operation system as well as the IndustrialDashCam software. This option must be used for when changing the IP-address of the IndustrialDashCam.

“Shutdown” button in the menu powers down the IndustrialDashCam. When using this option for shutting down the system, unsaved configurations of the system will be saved.

8 Support

Finally, if you have any open questions, the IMAGO support team is happy to assist you in any cases.

9 History

Revision	Date	Changes
1.2	Jan-07-2021	- Minor changes to trigger events and recording modes
1.1	Sep-14-2020	- Changed device name
1.0	Sep-05-2020	- First release