

WORKSWELL WEOM GUI

USER MANUAL

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2 Help and FAQ

2.1 General Instructions

While looking for a solution of any technical problem we recommend following these steps:

- try to find an answer by searching this User Manual
- contact your dealer
- contact Workswell technical support via support.workswell.eu.





3 User Information

3.1 Typographic Conventions

Following typographic conventions are used in this User Manual:

- UPPER CASE is used for the names of keys, buttons and menu items
- COURIER is used for file names and paths
- Italic is used for important information and document names
- underline is used for the links to other sections, for function names or Internet sites

3.2 Help and Support

For technical questions that were not answered in this User Manual feel free to contact your dealer or visit the product website at <u>workswell-thermal-camera.com</u>, or contact our support team via support.workswell.eu.

3.3 Updates

The primary aim of Workswell s.r.o. company is to supply their products in a way that meets the current needs of its users and at the same time to remove all the weaknesses that were found in their use as quickly as possible. For this reason, Workswell s.r.o. regularly releases updates for all their products.

Visit <u>my.workswell.eu</u> to download the latest firmware release. The update process itself is described in a later section.

3.4 Firmware

Firmware is the "internal" control program of the device. From the user's point of view, only the official firmware released by Workswell s.r.o. company can be used for update of the device.





4 Naming Conventions

4.1 Used abbreviations

Abbreviation	Term				
AGC	Automatic Gain control				
GUI	Graphical User Interface				
IGC	Image Gain Control				
MGC	MGC Manual Gain control				
NVM	Non-volatile Memory				
NUC	Non-uniformity Correction				
TCSI	Thermal Core Serial Interface				
TPG	Test Pattern Generator				
VM	Volatile Memory				
WEOM	Workswell Electro-Optical Module				

Table 4.1: Used abbreviations





5 General information

WEOM GUI is a desktop application that allows for controlling Workswell Thermal Core (WEOM). You can download it from my.workswell.eu, after registering your camera.

5.1 Additional resources, libraries and SDKs

- WEOM User manual The user guide for WEOM.
- <u>WEOMLink</u> a light weight C++ library for integrating WEOM into your application
- <u>WEOMPY</u> a Python module for WEOM control

5.2 System

5.2.1 Minimal system requirements

Operating system: Windows 10 or higherProcessor: i3 or equivalent AMD processor

■ RAM: 4GB

■ Storage: 1GB of free space

5.3 Installing WEOMGUI

To begin the installation process, run WEOM GUI-1.6.151.exe and follow instructions to customize your installation.

ID:





Figure 5.1: WEOM GUI Setup

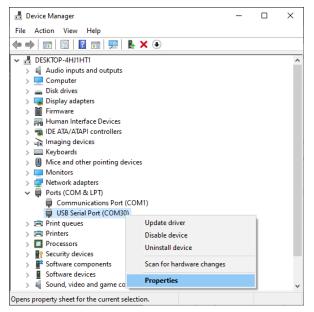
Note: The SETTINGS button in the bottom left corner is for advanced users and troubleshooting.

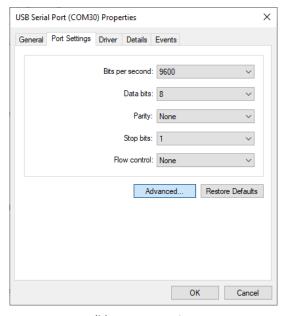


5.3.1 Operation system configuration

To ensure the best possible performance of WEOM GUI, it is recommended to set the highest available Baud rate (see chapter <u>6</u>) and lower port latency. The following procedure is applicable for HDMI and Analog plugins:

- Openthe Device Manager > Port (COM & LPT) > USB Serial Port (COM<number>). Note that the COM port number is uniquely and permanently assigned for every connected device.
- Right-click USB Serial Port (COM<number>) and select Properties, then navigate through Properties > Port Settings > Advanced.





(a) Port in Device manager

(b) Port properties

Figure 5.2: Location of port properties settings

 \blacksquare Find the Latency Timer (msec) under BM Options and change it to 2.

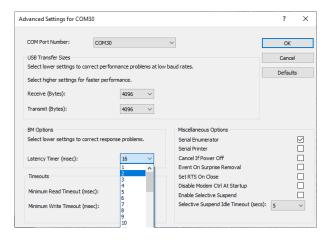


Figure 5.3: Latency timer



5.4 Application layout, behavior and control

5.4.1 Layout

Two themes are available, light and dark. Which one of them is applied is determined by the chosen Windows system theme. The content of the application is organized in tabs. Some of the tabs only appear after a successful connection of a WEOM. If a WEOM is connected, the Status bar is always visible at the bottom of the window, displaying the following information:

- Connected plugin
- Firmware version
- Shutter temperature
- Article number
- Progress bar (see the following section <u>5.5</u>)

5.5 Data transfer

Whenever WEOM GUI is transferring data from WEOM, there's a progress bar indicating the remaining time needed to complete the action. There are two types of progress bars:

- Non-blocking: If the progress bar is being displayed in the bottom tray, the user is free to navigate around the application and perform other actions (e.g. loading Palettes see section <u>11.3</u>).
- Blocking: If the progress bar is being displayed in its own dialog window, further actions are blocked until
 the progress bar finishes or the current action is canceled (e.g. capturing images see section 12.1).

5.5.1 Control

There are two levels of settings, corresponding to WEOM's VM (Volatile Memory) and NVM (Non-volatile Memory):

- When changing a value using a spinbox or by inputting the value directly in a field, the change needs to be confirmed by clicking the checkmark button (Apply the change to WEOM's VM) or canceled by clicking the revert button (Reset the edited value). Changes made with other methods (e.g. clicking another type of button or dragging a slider) are immediately applied to WEOM's VM.
- Pressing the SAVE button will then save the changes to NVM, preserving them between restarts.





6 Connection



Figure 6.1: Connection tab with WEOM connected

Connection tab is used for connecting to WEOM and to update the UVC plugin firmware. To connect to WEOM, the user should follow these steps:

- 1. Select the installed plugin.
- 2. Select the serial COM port or WEOM's ID if in the case of connecting to a GigE video plugin.
- 3. Click CONNECT.



For a guide to UVC plugin firmware update, refer to WEOM User Manual (available for download at my.workswell.eu).

Note: The GigE option is only available if eBus SDK OR eBus Runtime is installed.

Once connected, it's possible to change BAUD RATE between three settings:

- 115 200 BD
- 921 600 BD
- 3 000 000 BD

SAVE button will save the baud rate to NVM

Note:

- Higher BAUD RATE means higher connection speed.
- BAUD RATE cannot be changed for GigE video plugin. GigE connection will always run at the highest Baud rate of 3 000 000 Bd.

DISCONNECT button lets the user sever the communication to WEOM.





7 Core info

This tab provides general info about the connected WEOM and basic controls. Each of theses controls are further explained in the First connection chapter of the WEOM manual.

Note: For WEOM user manual, please visit my.workswell.eu.

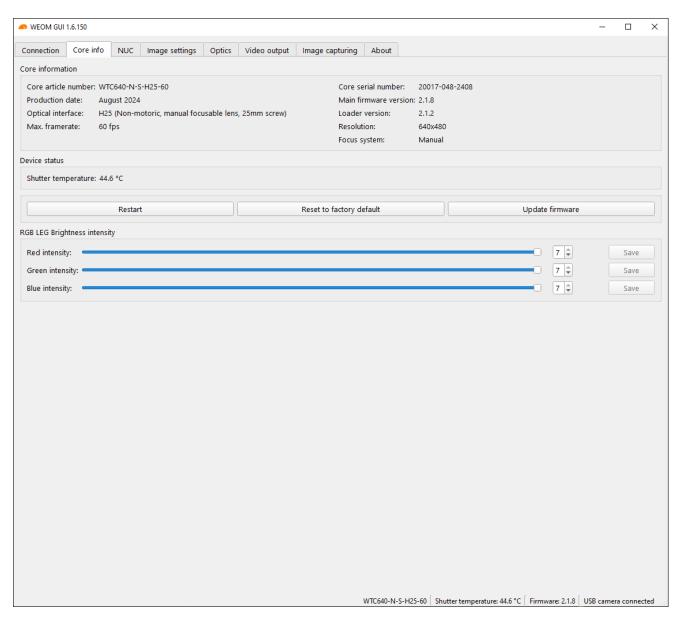


Figure 7.1: Core info tab

ID:



7.1 Core information

This section provides the following information:

- CORE ARTICLE NUMBER
- CORE SERIAL NUMBER
- PRODUCTION DATE
- MAIN FIRMWARE VERSION
- OPTICAL INTERFACE (Specifies the physical components of the optical and focusing system.)
- LOADER FIRMWARE VERSION
- MAX FRAME-RATE
- RESOLUTION
- FOCUS SYSTEM

7.2 Reset core

There are two types of reset:

- RESET CORE restarts WEOM and loads configuration from NVM
- RESET FACTORY sets default configuration to NVM and restarts WEOM, which will load the configuration into VM.

7.3 Firmware update

Clicking FIRMWARE UPDATE opens the file explorer. In the file explorer, the user selects the correct update file.

Note: The chosen file needs to correspond to the type of the plugin equipped to WEOM. For example, when trying to install firmware version 2.1.1 on a WEOM with HDMI plugin, the user needs to use the HDMI_2_1_1.uwtc file.

7.4 RGB LED Brightness intensity

There are three sliders in this section. Each controls the intensity of one of the LED RGB colors. Default and maximal value for each of them is 7.

Note: It's possible to turn all of them off, except Red, by setting the value to 0.

ID:





8 Non uniformity correction (NUC)

This tab serves to customize WEOM's non uniformity correction settings. Each of theses controls are further explained in the Non uniformity correction section of Video pipeline chapter in the WEOM manual.

Note: For WEOM user manual, please visit my.workswell.eu

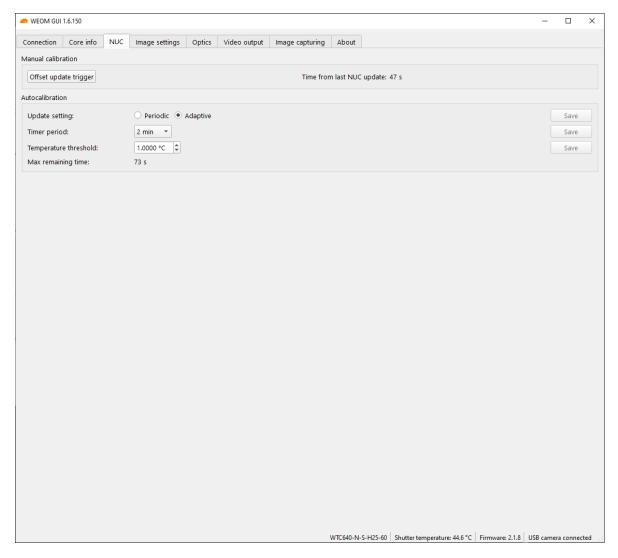


Figure 8.1: Non-uniformity correction tab



8.1 Manual calibration

Using the OFFSET UPDATE TRIGGER button, the user can trigger NUC offset update at any time. This section also displays the TIME FROM LAST NUC update.

8.2 Autocalibration

In UPDATE SETTING, there are two modes of automatic NUC execution:

- PERIODIC offset update after user defined period
- ADAPTIVE offset update after user defined period **or** after exceeding temperature threshold since last offset update.

TIMER PERIOD determines the maximum time WEOM is allowed to go without NUC offset update:

- 2 MINUTES
- 5 MINUTES
- 10 MINUTES
- 30 MINUTES
- 60 MINUTES (1 hour)
- 120 MINUTES (2 hours)

With ADAPTIVE setting enabled, the user can also change the SHUTTER THRESHOLD, which ranges from 0.25 °C to 10 °C (0.45 °F to 18 °F) with increments of 0.0625 °C (0.1125 °F). If the shutter temperature changes more than this value since the last NUC offset update, a NUC will be performed. MAX REMAINING TIME (in seconds) until the next NUC offset update are displayed here as well.

ID:





9 Image settings

This tab gives you options to configure various aspects of image processing. Each of theses controls are further explained in the Frame rate, Filters, Presets, Dead pixel correction and Image flip sections of Video pipeline chapter and in the Test pattern generator section of the Troubleshooting chapter in the WEOM manual.

Note: For WEOM user manual, please visit my.workswell.eu

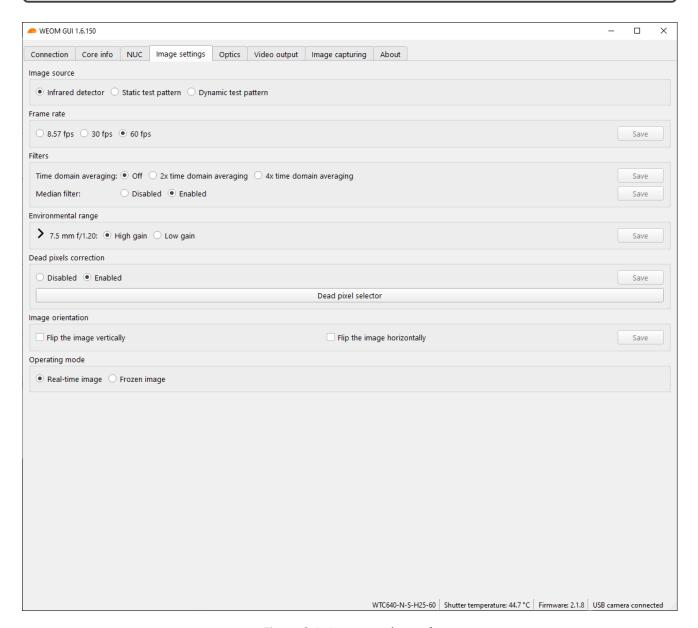


Figure 9.1: Image settings tab



9.1 Image source

In IMAGE SOURCE sub menu, the user is able to change the source of the images from the detector to various test patterns. A test pattern can be useful when adjusting video settings or for diagnostics. The user can choose from 3 image sources:

Option:	Description:
INFRARED DETECTOR	Real-time image from the detector
DYNAMIC TEST PATTERN	Stripes with a height of 20 px, with a moving line
STATIC TEST PATTERN	A chessboard-like pattern with 2 alternating values

9.2 Frame rate

If a WEOM is capable of a higher frame rate (last number in its article number is 30 or 60), it can be changed here. The options are:

- 8.57 FPS
- 30 FPS
- 60 FPS

9.3 Filters

Here the User can turn MEDIAN FILTER ON or OFF. With median filter ON, WEOM replaces a pixel value with the median value of its 8 adjacent pixels.

TIME DOMAIN AVERAGE can also be changed here, with the option being:

- OFF averaging is disabled
- 2X TIME DOMAIN AVERAGING averaging from 2 frames
- 4X TIME DOMAIN AVERAGING averaging from 4 frames

9.4 Environmental range

WEOM is calibrated for two different gain levels. Each gain option corresponds to an approximate temperature range:

HIGH GAIN: -50 °C to 160 °C (-58 °F to 320 °F)

■ LOW GAIN: -50 °C to 600 °C (-58 °F to 1112 °F)



Note: ENVIRONMENTAL RANGE constitutes one part of the Preset configuration. The other half can be changed in the OPTICS tab or by clicking the Expand arrow , which will expand the section with the available LENS options. Refer to WEOM User manual found on my.workswell.eu for more info on Presets.

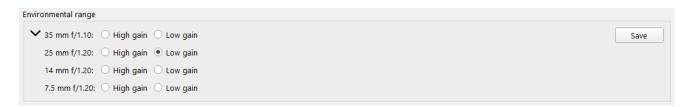


Figure 9.2: Environmental range menu expanded

9.5 Dead pixels correction

The utility used to configure Dead pixels correction is named Dead pixel selector. Its interface consists of three parts:

- 1. The Dead Pixel Wizard consists of three sections. It's possible to change their relative sizes by clicking and dragging their edges to suit the User's needs.
- 2. The IMAGE section is the starting point. It's possible to either capture an image from the detector using the CAPTURE IMAGE button, or to upload an image using the LOAD IMAGE button. Make sure that the DISABLED option is chosen in the DEAD PIXELS CORRECTION section before taking the picture. This helps to ensure that all the malfunctioning pixels are identified and prevents over-correction of properly functioning pixels. The SAVE IMAGE button can then be used to store the image for future use or reference.
- 3. The window on the left is used to input the Dead Pixels. It's possible to zoom in to find the precise malfunctioning pixel and then select it using double-click. The numbers in the bottom left corner [x, y] n are the coordinates and the overall number of the pixel pointed at with the cursor. Once the pixel is selected, WEOM automatically selects its replacement. The pixel being replaced is highlighted red and its replacement is highlighted green.
- 4. The GRID ENABLE checkbox shows/hides the highlight of the pixels being replaced to make sure that only the defective and no other pixels are being replaced.
- 5. Once a pixel is selected, it appears in the table on the right together with its replacement(s). From there, it's possible to select and delete any number of pixels to fix possible mistakes using the DELETE SELECTED DP button.
- 6. The revert button will undo all changes made up to this point. The check mark icon serves to preview all the changes made. Clicking it will save the current table to VM.
- 7. Now it's recommended select ENABLED in the DEAD PIXELS CORRECTION section and capture a new image to make sure that all the malfunctioning pixels have been replaced.
- 8. If the user is satisfied with the corrections made, clicking the SAVE button will store the pixels in the NVM to be preserved between restarts.



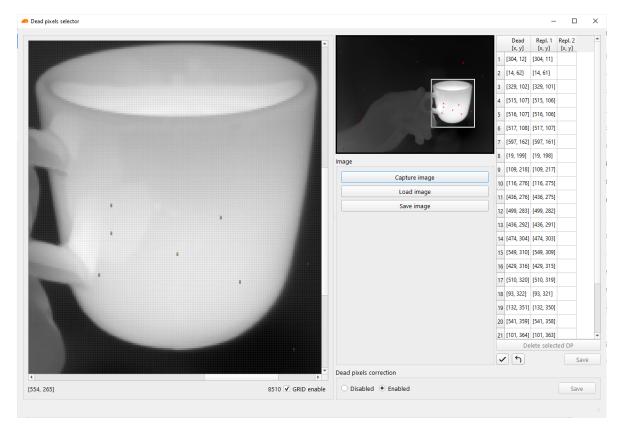


Figure 9.3: Dead Pixel selector

9.6 Image orientation

In the Image orientation sub menu, there are 2 checkboxes:

Option:	Description:							
FLIP THE IMAGE VERTICALLY	Reverts the image along the X axis							
FLIP THE IMAGE HORIZONTALLY	Reverts the image along the Y axis							

Checking both will result in the image being flipped along both axes.

9.7 Operating mode

This allows for switching between REAL-TIME IMAGE and FROZEN IMAGE.

- REAL-TIME IMAGE Image is continuously let through WEOM video pipeline.
- FROZEN IMAGE A single image is saved in the WEOM video pipeline, which is then sent towards video output.





10 Optics

For further information about each of WEOM's lenses, please see their specific data sheet on my.workswell.eu.

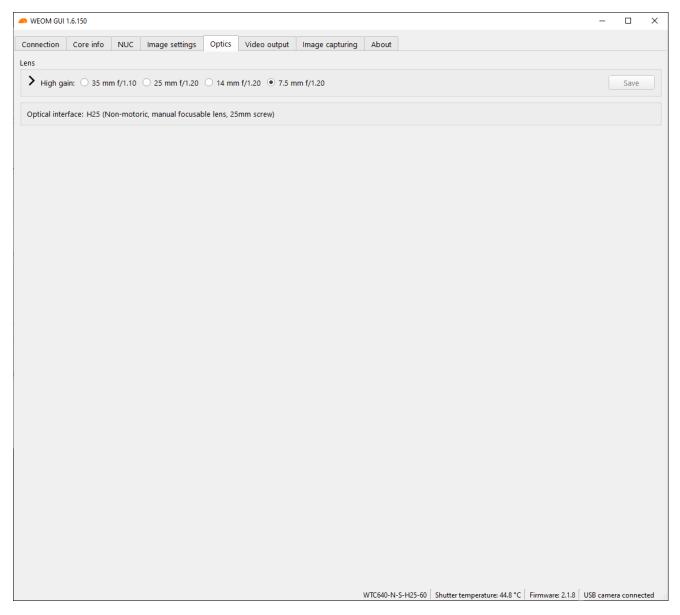


Figure 10.1: Optics tab

10.1 Lens

WEOM is configured for multiple different lenses. To ensure the best possible image quality, the currently mounted lens needs to be selected from the LENS menu.



Note: LENS constitutes one part of the Preset configuration. The other half can be changed in the IMAGE SETTINGS tab or by clicking the Expand arrow , which will expand the section with the available ENVI-RONMENTAL RANGE options. Refer to WEOM User manual found on my.workswell.eu for more info on Presets.



Figure 10.2: Lens menu expanded

Warning: Incorrectly selected lens will have a negative impact on the image quality.





11 Video output

In this tab, the image gain control and subsequent coloring can be configured. Information in this chapter is further expanded upon in the Image gain and Palettes section of the Video pipeline chapter in WEOM user manual.

Note: For WEOM user manual, please visit my.workswell.eu.

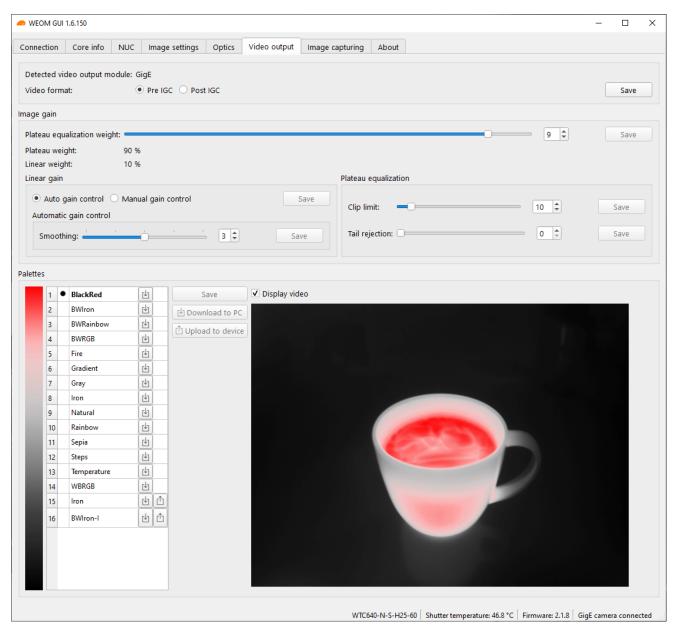


Figure 11.1: Video output tab



Note: After switching into this tab, WEOM GUI will start loading available palettes (see section $\underline{11.3}$). This action can take some time, but it doesn't block further actions (see section $\underline{5.5}$).

11.1 Detected video output module

This section displays the currently mounted plugin. Each plugin offers a subset of these video output formats:

- PRE IGC
- POST IGC
- POST COLORING

Refer to the WEOM user manual for an overview of plugins and their corresponding available formats.

11.2 Image gain

Image gain configures the final distribution of histogram data from Pre IGC (MONO 14) to Post IGC (MONO 8). PLATAU EQUALIZATION WEIGHT determines the ratio of Plateau vs Linear Equalization applied. The numbers below the slider show the respective methods' weight.

11.2.1 Linear gain

Linear gain determines the contrast and brightness of the output signal. You can set two different modes here:

11.2.1.1 Automatic gain control

Contrast and brightness are continuously automatically computed based on the values from the previous image(s). With Automatic gain control enabled, the user is able to choose how many images are used for this calculation on the SMOOTHING slider or input them in the spinbox next to it.

11.2.1.2 Manual Gain Control

Contrast and brightness are set manually. Click and drag the sliders to set the desired values, or click in the value field and input them directly via keyboard. A good starting point is to click AUTO ADJUST, which will compute the values from the current input from the detector as in the Automatic gain control mode, but only once. You can then move the sliders set the values according to your preference.

11.2.2 Plateau equalization

The tail rejection and clip limit percentages can be adjusted with sliders.

ID:



- CLIP LIMIT defines the maximum allowable height of the histogram bins. By setting a threshold, this
 prevents certain pixel intensity ranges from becoming overly dominant.
- TAIL REJECTION controls the rejection of outlier pixel intensities.

11.3 Palettes

A palette is a file that holds a map from the Post IGC format to the Post-Coloring format. This section contains a table containing 14 Factory and 2 User palettes. Only the User palettes can be changed. A particular palette is applied by double clicking it in the table. The currently applied palette is represented in a vertical strip to the left of the table with the highest temperature at the top.

SAVE – Saves the current palette as the default one to be applied upon restarting or initializing the device. Any individual palette can be downloaded by using the Download icon in the respective row. DOWNLOAD TO PC button saves all the selected palette(s) to a computer.

The two User palettes can be replaced with custom palettes using the upload icon next to the respective palette. Alternatively, both of them can be uploaded at once by selecting them and clicking UPLOAD TO DEVICE button next to the Palette table.

A palette is essentially a **.csv** file with semicolon as the separator with 255 rows where every row has three values representing the intensity of red, green and blue colors. For example, a grey palette that maps the lowest temperature to black and the highest to white would have the first and last three lines looking like this:

The palette file has extension .plt. One way to create a .plt file is to make a new .xls file, populate the first three columns and 255 rows with the desired values and then export it as .csv file, then change the extension to .plt.

11.4 Video stream

There is an option to preview the video stream in the bottom right section of the Video Output tab by clicking the DISPLAY VIDEO checkbox. This is available for GigE and USB3 plugins only.

11. VIDEO OUTPUT



Note: When Pre IGC or Post IGC video format is chosen, the image is colored by TCG with the same palette that is set in WEOM.





12 Image capturing

This tab serves to capture Pre IGC (MONO 14) images from WEOM and to open and display them.

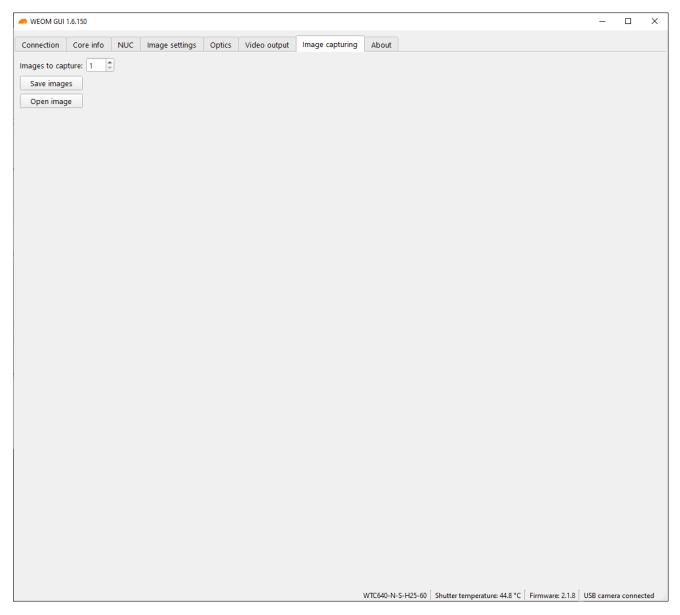


Figure 12.1: Image capturing tab

12.1 Capturing an image

To capture images:

1. Choose how many consecutive pictures do you want to capture.



- 2. Click SAVE IMAGES.
- 3. A window will appear to choose the location of the captured images.

Note: The time required to save an image depends mainly on Baud rate (see chapter $\underline{6}$) and port latency (see section $\underline{5.3.1}$).

12.2 Opening an image

Clicking OPEN IMAGE opens a window to find and open any .wti images.

Note: .wti images contain data in Pre IGC format. These images can only be opened using WEOM GUI or WEOMPy.

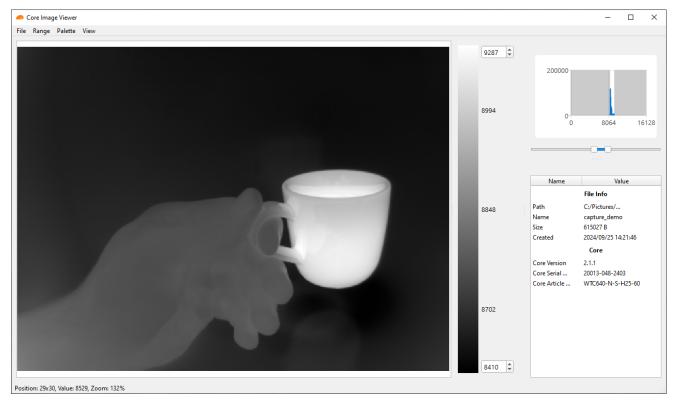


Figure 12.2: Core image viewer

Core Image Viewer offers various options in its menu bar to process and export the image, similar to options in the Video output tab (see chapter <u>11</u>).

FILE:

Offers several options for file manipulation:



- OPEN IMAGE open another .wti image
- EXPORT IMAGE Export the image in various formats:
 - TIFF Pre IGC data
 - JPEG Highly compressed Post Coloring picture (some information is lost in exchange for smaller size)
 - PNG Losslessly compressed Post Coloring picture
 - RAW BINARY Pre IGC data
 - CSV TABLE Pre IGC data, can be opened in a spreadsheet software
 - WTI Pre IGC data, can be opened in Core Image Viewer
- CLOSE IMAGE Close Core Image Viewer

RANGE:

Applies one of the two available Image gain control methods:

- AUTOMATIC Sliders determining the way Pre IGC values are mapped to Post-IGC are automatically set to optimal values.
- MANUAL The user is able to set minimum and maximum Pre IGC values to be mapped to Post IGC format.

For more details on Image equalization see <u>11.2.1</u>.

PALETTE:

Changes the Palette used to map Post IGC values to Post Coloring format, determining the final look of the viewed image. For details on coloring using palettes see <u>11.3</u>.

VIEW:

- ZOOM IN
- ZOOM OUT
- FIT IMAGE IN WINDOW





13 About

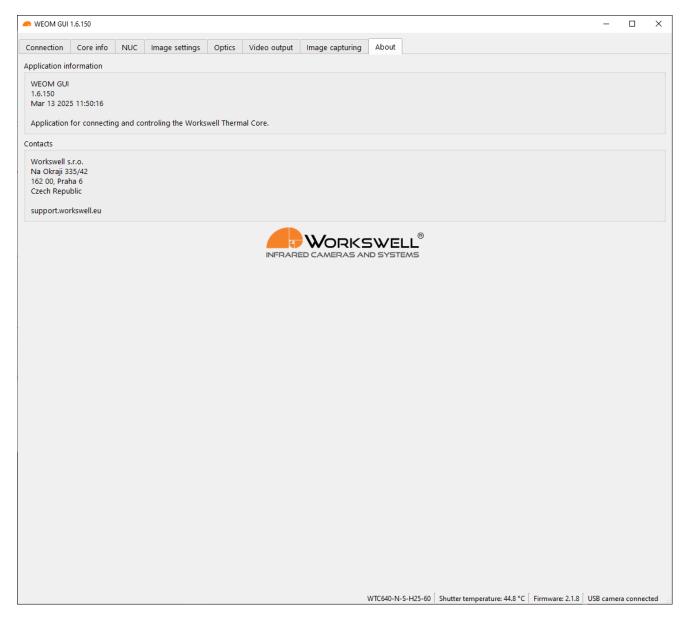


Figure 13.1: About tab

13.1 Application Information

Contains WEOM GUI version, and time and date of its publication.



13.2 Contacts

Contains the address of our office and the web address of our support service.





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