

User Manual for Terabee IND-Thermal-90 Graphical User Interface (GUI)



Table of contents

1. Introduction	3
2. Connection to PC	3
2.1. Hardware setup	3
3. GUI installation and execution	6
3.1. Windows	6
3.2. Ubuntu (18.04 LTS and above)	6
4. GUI structure	7
4.1. Top level static menu	8
4.2. Connection tab	9
4.3. Settings tab	9
4.4. Application 1 page	11
4.5. Application 2 page	15
4.6. Application 3 page	17

1. Introduction

The purpose of this document is to explain the usage of the IND-Thermal-90 thermal camera Graphical User Interface (GUI) for PC connection. Such a GUI is designed to help the customer get experience with the camera.

2. Connection to PC

This section provides guidelines on connection and sensor evaluation on a PC, using Microsoft ® Windows ® OS and Ubuntu. This includes instructions on hardware arrangement, software setup using the Terabee IND-Thermal-90 GUI and examples on executing commands for modifying some of the basic sensor parameters.

2.1. Hardware setup

Figure 1 illustrates connection logic between the IND-Thermal-90 sensor and a PC, and the following components are required for a complete setup:

- 1 × Terabee IND-Thermal-90 sensor
- 1 × Straight M12 5-pin A-coded cable of your preference (example [here](#), *not provided by Terabee*)
- 1 × RS485-to-USB adapter (example [here](#), *not provided by Terabee*)
 - (Not mandatory) 1 × USB extension cable (already available in suggested RS485-to-USB package) to connect to PC Control Unit (PC)
- 1 × Power Supply capable of supplying 12-24V DC @ >50mA

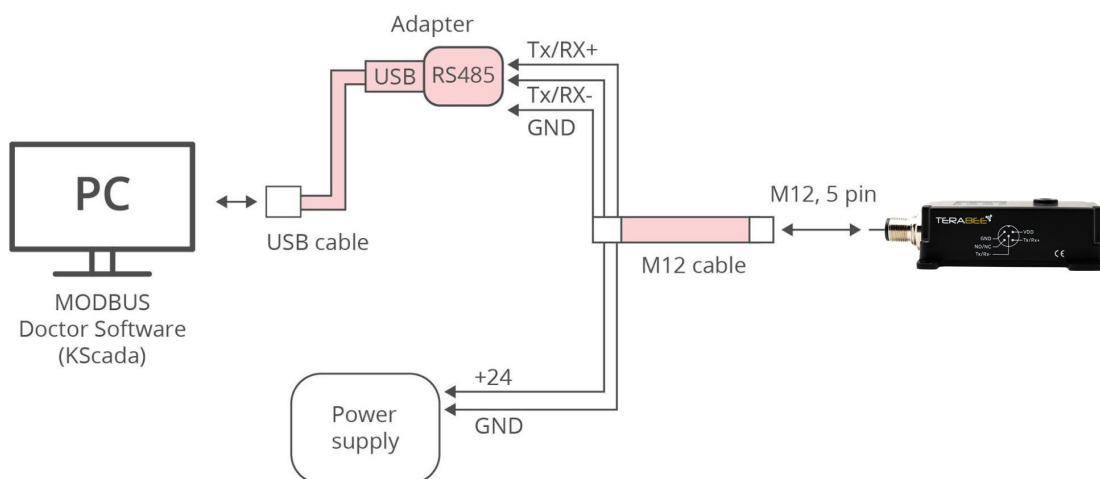


Figure 1. IND-Thermal-90 connection to PC: hardware setup diagram

The following summarizes the steps to be taken for connecting the IND-Thermal-90 camera to a PC.

Step 1

Connect the M12 cable to the sensors M12, 5-pin connector.

Step 2

Connect the data lines of the M12 cable to the RS485-to-USB adapter. See wiring instructions in [Table 1](#).

Table 1 - Wiring connection between IND-Thermal-90 and RS485-to-USB adapter

M12 cable	Specific for RS485-to-USB adapter here
Tx/Rx+ (pin 4)	A+
Tx/Rx- (pin 5)	B-
Ground (pin 2)	GND

Step 3

Connect the power lines of the M12 cable to a power supply source. See wiring instructions in [Table 2](#). Wire +24 V (pin) and GND (pin) to the selected power supply (capable of providing 24 V supply).

Table 2 - Wiring connection between IND-Thermal-90 and Power supply

M12 cable	Power supply
12V ... 24V DC power supply (pin 1)	Positive pin
GND (pin 2)	Negative pin

Step 4

Connect the RS485-to-USB adapter to the USB port of your PC. An extension USB cable (provided with the recommended adapter) from the adapter to the PC might be useful.

Step 5

Power the sensor by turning on the power source.

Step 6

The camera LED indicator PWR will now constantly stay ON (GREEN) to confirm proper voltage supply. STATUS LED will also turn green confirming normal operation¹.

Step 7

¹ At camera startup, if there is already an alarm condition active and the NO/NC output is enabled, STATUS led might turn ON in GREEN color and quickly (after 1-2 seconds) switch to RED.

The hardware setup is completed and the user can now proceed to configuring basic software parameters.



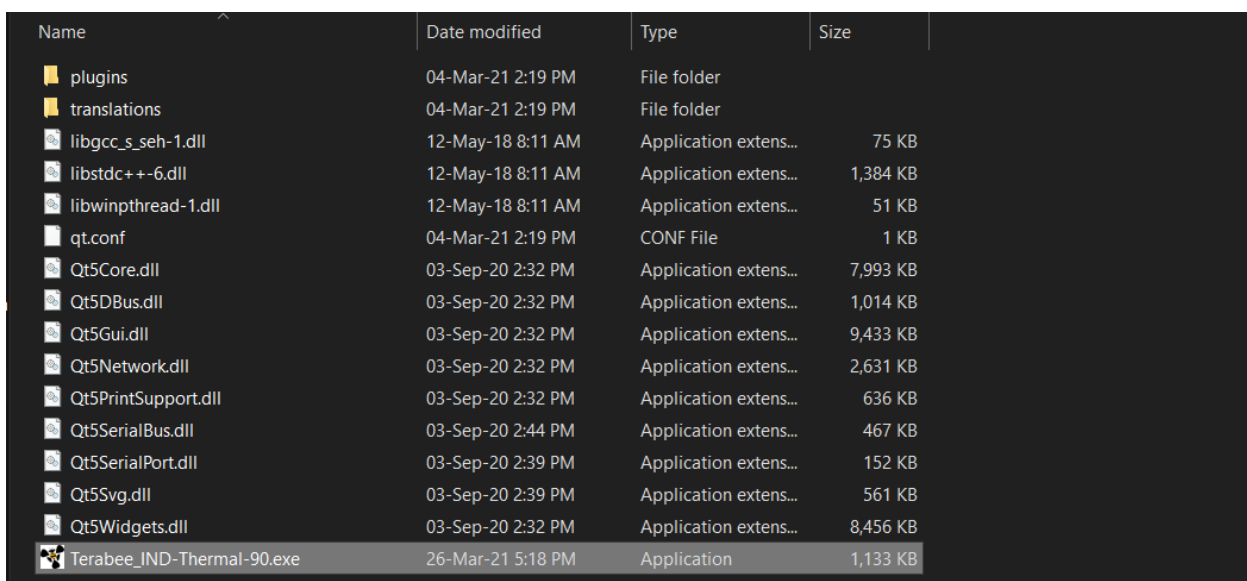
During power up the sensor will apply the last operating parameters used or default ones if it's the first boot-up

Note: The NO/NC line is not used in this setup, it can be left floating or shorted to ground

3. GUI installation and execution

3.1. Windows

Download the file IND-Thermal-90-GUI installer from the [Terabee product webpage](#). Execute the **.exe** file and follow the installation instructions. The installer will create a Start Menu shortcut for easy access by accessing **Start -> type IND-Thermal-90 -> Click on GUI icon**. Alternatively, the executable can be found under the default installation path (see [Figure 2](#)), usually **C:\Program Files (x86)\Terabee\IND-Thermal-90\Application**. The folder is shown below, and the executable highlighted. Double click on **Terabee_IND-Thermal-90.exe** to start the software.



Name	Date modified	Type	Size
plugins	04-Mar-21 2:19 PM	File folder	
translations	04-Mar-21 2:19 PM	File folder	
libgcc_s_seh-1.dll	12-May-18 8:11 AM	Application extens...	75 KB
libstdc++-6.dll	12-May-18 8:11 AM	Application extens...	1,384 KB
libwinpthread-1.dll	12-May-18 8:11 AM	Application extens...	51 KB
qt.conf	04-Mar-21 2:19 PM	CONF File	1 KB
Qt5Core.dll	03-Sep-20 2:32 PM	Application extens...	7,993 KB
Qt5DBus.dll	03-Sep-20 2:32 PM	Application extens...	1,014 KB
Qt5Gui.dll	03-Sep-20 2:32 PM	Application extens...	9,433 KB
Qt5Network.dll	03-Sep-20 2:32 PM	Application extens...	2,631 KB
Qt5PrintSupport.dll	03-Sep-20 2:32 PM	Application extens...	636 KB
Qt5SerialBus.dll	03-Sep-20 2:44 PM	Application extens...	467 KB
Qt5SerialPort.dll	03-Sep-20 2:39 PM	Application extens...	152 KB
Qt5Svg.dll	03-Sep-20 2:39 PM	Application extens...	561 KB
Qt5Widgets.dll	03-Sep-20 2:32 PM	Application extens...	8,456 KB
Terabee_IND-Thermal-90.exe	26-Mar-21 5:18 PM	Application	1,133 KB

Figure 2. Terabee_IND-Thermal-90.exe GUI executable inside the installation directory on Microsoft
® Windows ®

3.2. Ubuntu (18.04 LTS and above)

Download the file IND-Thermal-90-GUI installer from the [Terabee product webpage](#). Allow executing the file as a program by typing in the console **chmod +x %filename%** where **%filename%** is the name of the downloaded file. Double click the **.run** file and follow the installation instructions. The default install path is **/home/%user%/Terabee/IND-Thermal-90**, where **%user%** is the name of the current logged in user. To start the application, open a new terminal in the IND-Thermal-90 folder and type **./Terabee_IND-Thermal-90.sh**. This will start the software. Alternatively, type **\$HOME/Terabee/IND-Thermal-90/Terabee_IND-Thermal-90.sh** in a terminal window from any other location.

4. GUI structure

This section describes the different sections of the GUI. To start, it is needed to differentiate between the static and dynamic parts of the interface. [Figure 3](#) illustrates the parts. From top to bottom: the static menu, above the first red line. The dynamic section, between the two red lines. The bottom static part (logo), under the second red line. The dynamic section will change when switching between the different tabs. The static ones will not.



All fields marked with “(i)” will reveal more information about the specific parameters when the mouse is hovered over them.

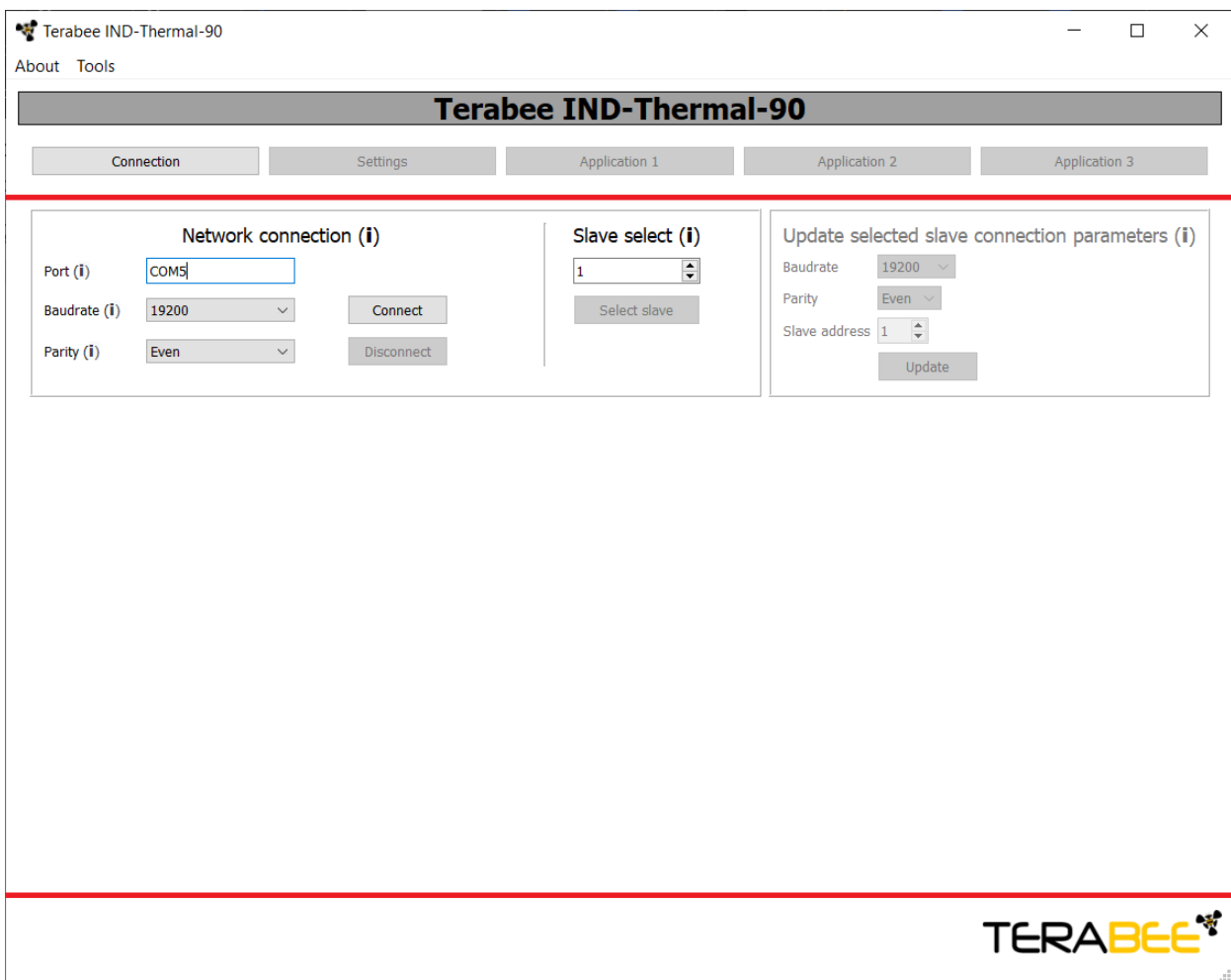


Figure 3. Landing (Connection) page of the Terabee IND-Thermal-90 GUI

4.1. Top level static menu



Figure 4. Landing (Connection) page of the Terabee IND-Thermal-90 GUI

This (static) section (see [Figure 4](#)) is the main navigation interface between the different dynamic sections. A breakdown of the different buttons and their functionalities is listed as follows (starting from the top left corner):

- **About**
 - **License** - this opens up a small pop up window describing the version of the GUI and its license. It contains information about third party libraries as well.
 - **Product page** - pressing this will open the default web browser to the product page of the Terabee IND-Thermal-90
- **Tools**
 - **Factory reset** - pressing this will reset the currently selected sensor to the factory default settings. A warning pop up with some text explaining what is about to happen will be displayed and a Yes/No confirmation will be expected from the user.



A sensor restart (power off-on cycle) is highly recommended after this action.

- **Connection** - pressing this button will switch the dynamic section of the window to the Connection tab.
- **Settings** - pressing this button will switch the dynamic section of the window to the Settings tab.
- **Application 1** - pressing this button will switch the dynamic section of the window to the Application 1 tab.
- **Application 2** - pressing this button will switch the dynamic section of the window to the Application 2 tab.
- **Application 3** - pressing this button will switch the dynamic section of the window to the Application 3 tab.

4.2. Connection tab

At start, the GUI will open the Connection tab and the window will look like in [Figure 3](#).

On the left side of the window, there is the connection to the network section. This contains 3 fields and 2 buttons, as follows:

- **Port** - this entry field allows the user to select the physical port to which the RS485 to USB adapter is connected. Information on how to obtain the port number can be seen if the mouse cursor is hovered over the field for about 1 second.
- **Baudrate** - this scroll down menu allows selecting the baudrate of the connection. This selection needs to match the baudrate of the IND-Thermal-90 sensor. By default, this value is 19200.
- **Parity** - this scroll down menu selects the parity of the connection. This selection needs to match the parity of the IND-Thermal-90 sensor. By default, this value is Even.
- **Connect** - once the settings are correctly selected, pressing the button Connect will open the communication port to the RS485 network.
- **Disconnect** - disconnects the port.

The slave device selection is placed to the right of the network connection, separated by a vertical line. Once the network connection is established, select the slave device to address. The slave IDs can be in the range of 1-247, default value being 1. Once the correct slave ID is selected, press Select slave. This will start a routine that will verify the connection to that specific device and, if the connection is validated, it will enable the rest of the buttons of the interface.

Finally, on the far right side of the window, contained within a box, there is a section which can update the selected device network configuration. This can be done by selecting the new desired parameters, such as baudrate, parity, and slave address, then clicking on Update. A small pop up window with more details and a confirmation button will appear. The change of these parameters corresponds to the holding registers at address 0 (Device address) and 1 (RS485 parameters).



A sensor restart (power off-on cycle) is highly recommended after this action.

4.3. Settings tab

This section (shown in [Figure 5](#)) handles the device's global settings, meaning it defines how the electrical NO/NC pin behaves and which applications are allowed to trigger an action on the pin.

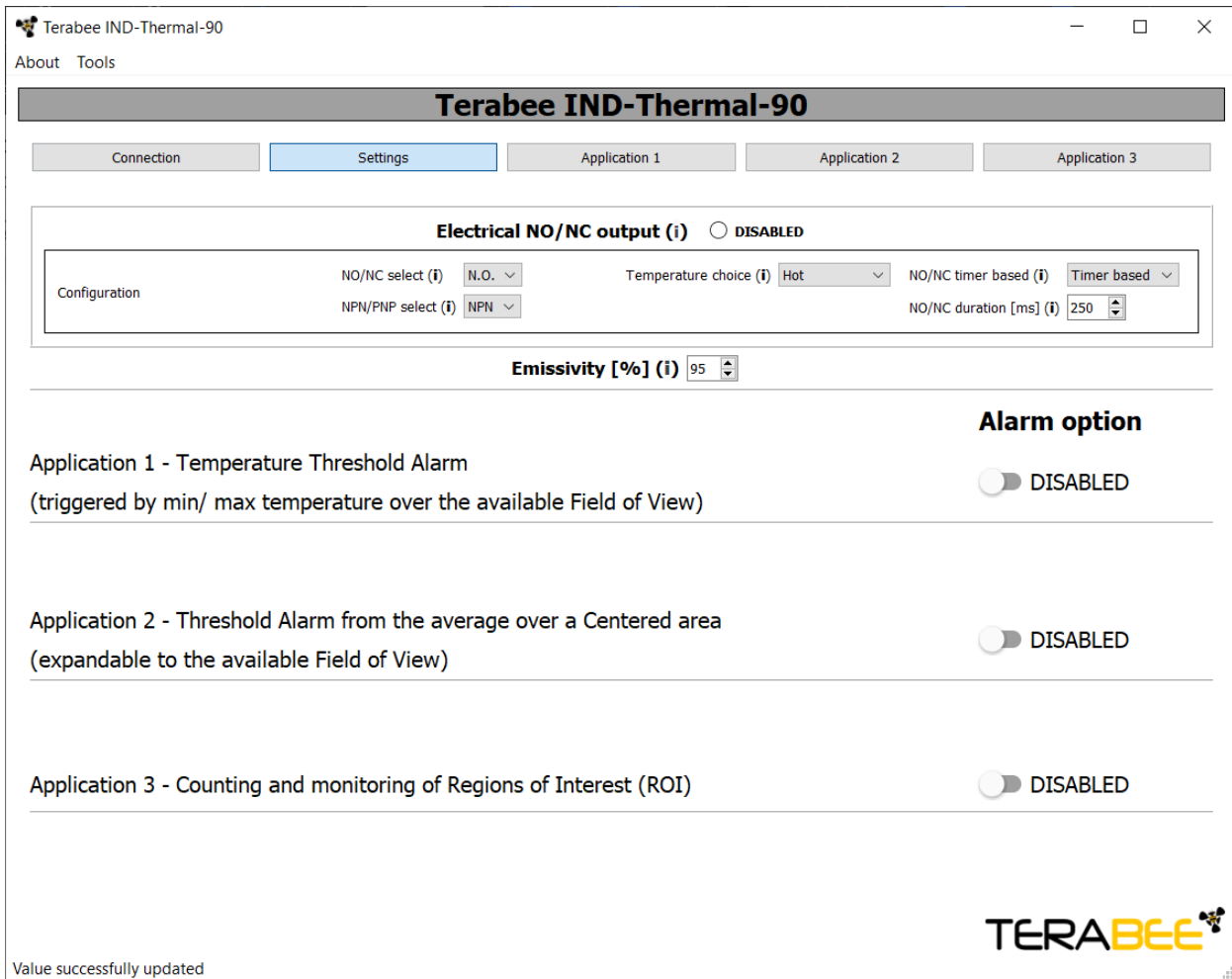


Figure 5. Screenshot of the Settings tab

The list of options is reported below (starting from the top):

- **Electrical NO/NC output** - this button acts as a master switch and defines whether the NO/NC pin can be actuated. If this is disabled (not checked), even if there is an alarm condition in an enabled application, the electrical output will not react. Toggling (checking) this corresponds to writing TRUE or FALSE to the Input Coil at address 0 (NO/NC enabled/disabled).
- **NO/NC select** - this scroll down menu defines whether the electrical pin will act as a normally open or normally closed contact. Changing this corresponds to writing TRUE or FALSE to the Input Coil at address 2 (NO/NC selected).
- **NPN/PNP select** - this scroll down menu defines the type of circuit used to actuate the pin. In an NPN circuit (also known as a sinking output) the pin will short to ground when activated. On the other hand, a PNP circuit (also known as sourcing output) will provide 24V @ 450mA when activated. Changing this setting corresponds to writing TRUE or FALSE to the Input Coil at address 3 (NPN/PNP selected).

- **Temperature choice** - this scroll down menu defines which thresholds are being used for the applications. There are 3 options: Hot, Cold, and Hot & Cold. Changing this parameter corresponds to writing to the Holding Register at address 13 (Temperature choice).
- **NO/NC timer based** - this scroll down menu defines how the electrical pin gets reset. There are two choices: Timer based and Action based. Timer based means the pin will reset after the delay seen in the field below this (NO/NC duration), whereas Action based means the pin will remain active until the Reset NO/NC pin button gets pressed on one of the applications screen. Changing this setting corresponds to writing TRUE or FALSE to the Input Coil at address 1 (NO/NC timer based).
- **NO/NC duration** - this input field defines how long the electrical output will remain active when NO/NC timer based is set to TRUE (Timer based). This field can be manually edited in the range 50-2000. Changing this value corresponds to writing to the Holding Register at address 8 (NO/NC ON time). Press ENTER to save the value.
- **Emissivity** - This input field allows selecting the emissivity of the target. The values are defined from 1 to 100, corresponding to a real emissivity range between 0.01 (1 in this box) and 1 (100 in this box). For best results, this value should match the emissivity of the material being measured. Changing this value corresponds to writing to the Holding Register at address 9 (IND-Thermal-90 emissivity). Press ENTER to save the value.
- **Application 1, 2, and 3** - Switching buttons to enable or disable the respective applications alarm. Toggling these buttons corresponds to writing TRUE or FALSE in the Input Coils at addresses 5 (Application 1 (alarm) enabled/disabled), 6 (Application 2 (alarm) enabled/disabled), and 7 (Application 3 (alarm) enabled/disabled).

4.4. Application 1 page

This screen (shown in [Figure 6](#)) shows all the necessary functions for Application 1. As all Application screens, it can be split into two parts: the application specific settings on the left and the image on the right.

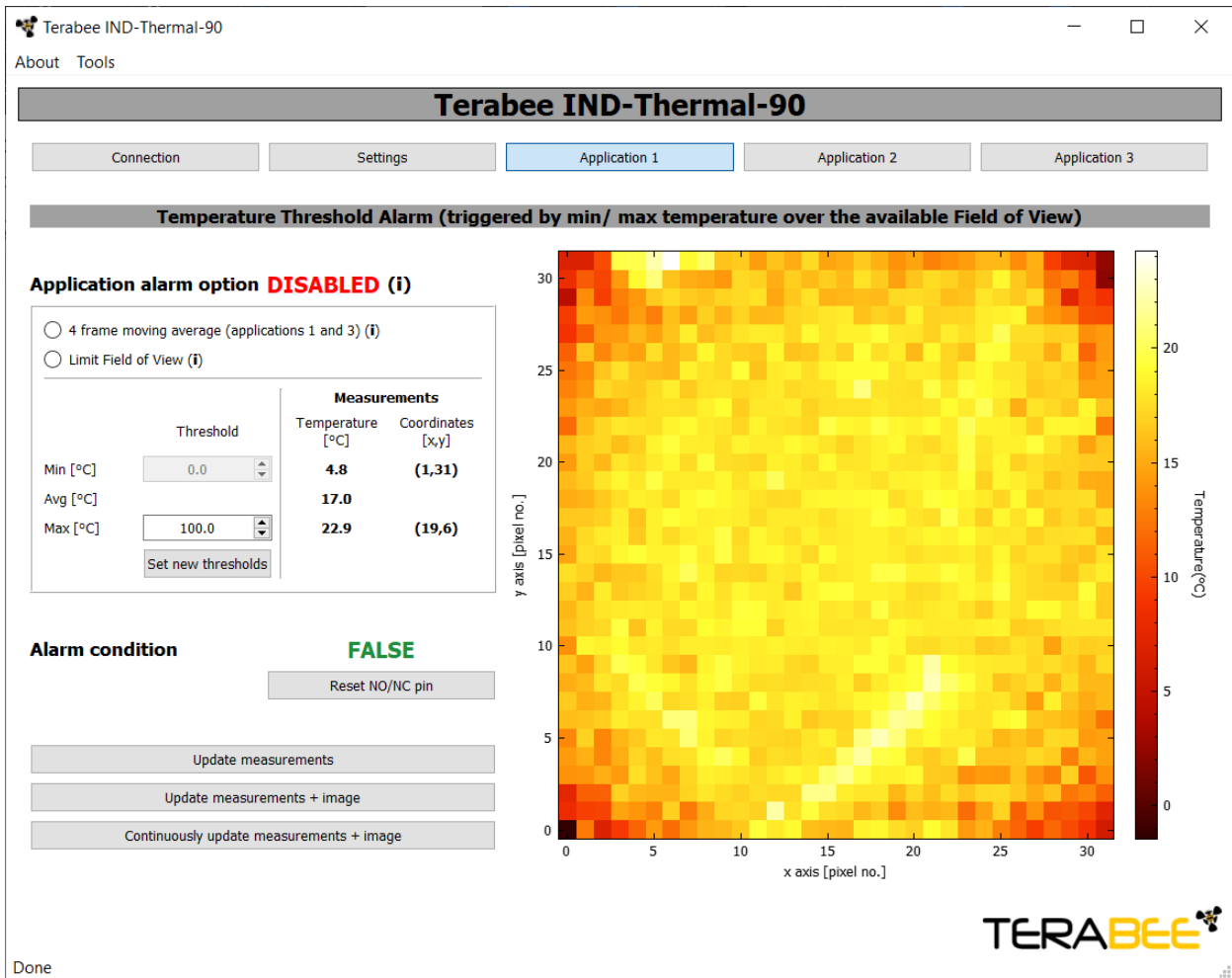


Figure 6. Application 1 tab

Starting from the settings on the left, the elements are as follows:

- **Application alarm option ENABLED/DISABLED** - status text based on the selected settings in the Settings page. If the application's alarm is enabled, this text will read Application alarm option ENABLED (enabled in green color), otherwise Application alarm option DISABLED (disabled in red color).
- **4 frame moving average (applications 1 and 3)** - checking this button will enable a 4 frame temporal moving average for applications 1 and 3. The moving average will smoothen the image, reducing some of the noise. Changing this setting corresponds to writing TRUE or FALSE to the Input Coil at address 10 (Application 1 and 3 moving average).
- **Limit Field of View** - checking this button will limit the scanning of Application 1 to the inner 20×20 pixels, thus reducing the impact of the wide angle lens which results in the edges being more noisy. An overlay will be drawn over the image highlighting the area scanned, as shown in Figure 7. Changing this setting corresponds to writing TRUE or FALSE to the Input Coil at address 9 (Application 1 limited FoV flag).

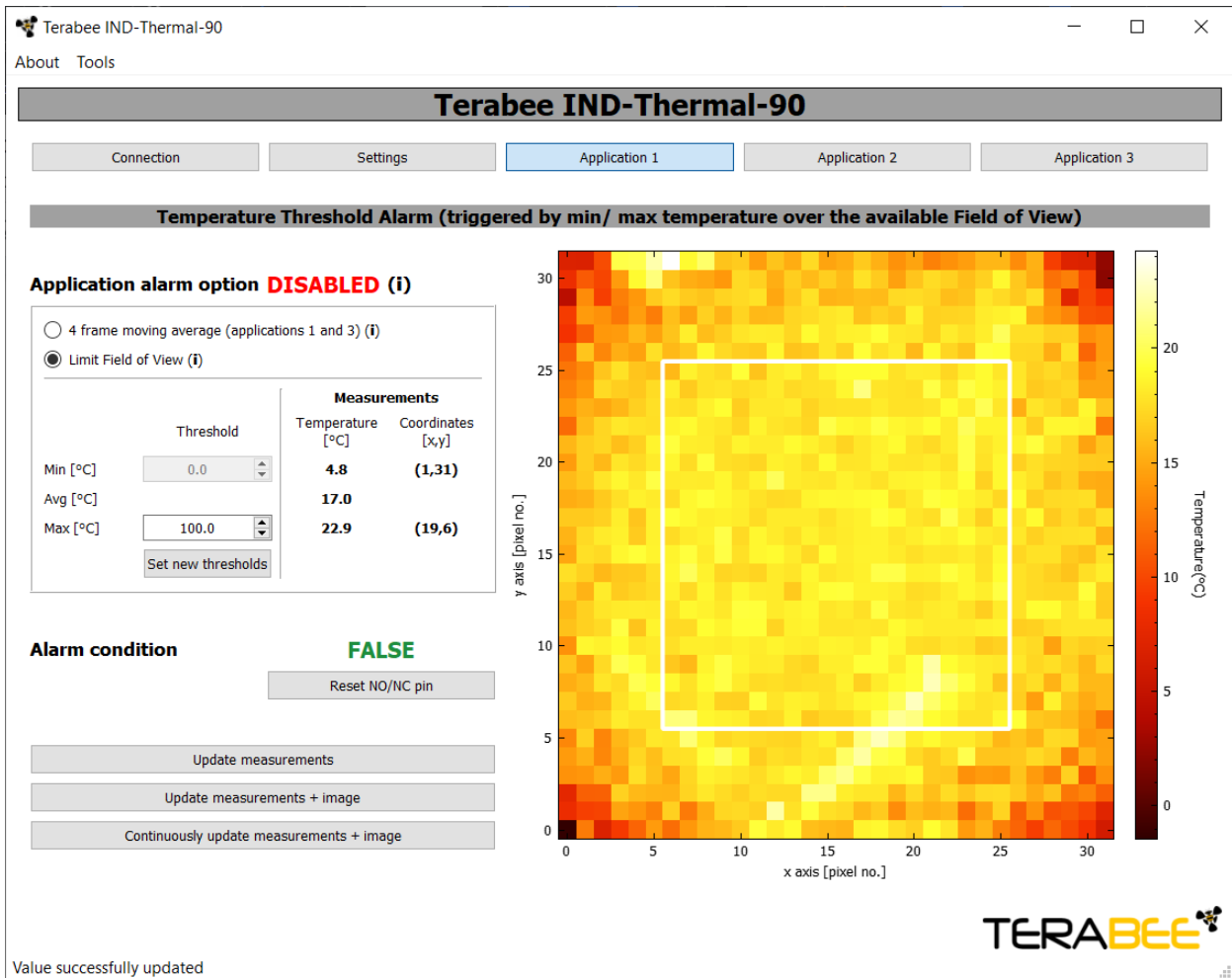


Figure 7. Application 1 tab with Limit Field of View = TRUE

- **Threshold temperatures**

- **Min[°C]** - this input field defines the minimum (cold) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Cold* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 3 (Application 1 cold threshold).
- **Avg[°C]** - no data here, value is displayed in the *Measurements* panel, described in the following point.
- **Max[°C]** - this input field defines the maximum (hot) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Hot* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 2 (Application 1 hot threshold).
- **Set new thresholds** - press this button to send the limit values currently shown in the *Min[°C]* and *Max[°C]* fields to the device.

- **Measurements**
 - **Temperature[°C]**
 - **First row (Min[°C])** - this value represents the temperature of the coldest pixel in the used Field of View. This value is taken from the Input Register at address 0 (Application 1 minimum temperature) and converted to degrees Celsius.
 - **Second row (Avg[°C])** - this value represents the average temperature over the used Field of View. This value is taken from the Input Register at address 4 (Application 1 mean temperature) and converted to degrees Celsius.
 - **Third row (Max[°C])** - this value represents the temperature of the hottest pixel in the used Field of View. This value is taken from the Input Register at address 2 (Application 1 maximum temperature) and converted to degrees Celsius.
 - **Coordinates [x,y]**
 - **First row (Min[°C])** - this value represents the xy coordinates of the coldest pixel in the used Field of View. This value is taken from the Input Register at address 1 (Application 1 minimum YX coordinates) and converted to xy coordinates.
 - **Third row (Max[°C])** - this value represents the xy coordinates of the hottest pixel in the used Field of View. This value is taken from the Input Register at address 3 (Application 1 maximum YX coordinates) and converted to xy coordinates.
- **Alarm condition TRUE/FALSE** - this field shows the status of the application. If this flag is set to TRUE (red color), it means that there is a breach of the threshold temperature and, if the application's alarm is enabled, it will activate the electrical NO/NC pin. This value is taken from the Discrete Input at address 2 (Application 1 alarm triggered).
- **Reset NO/NC pin** - pressing this button will write FALSE to the Input Coil at address 11 (Clear NO/NC) and will deactivate the electrical NO/NC pin. This function is used when the *NO/NC timer based* parameter is set to FALSE (Action based) and thus requires manual reset.
- **Update measurements** - by pressing this button the GUI software will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status). This is a fast operation and will not update the image.
- **Update measurements + image** - pressing this button will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status) and the image. This is a slow operation and requires over 10 Modbus requests.
- **Continuously update measurements + image** - pressing this button will trigger an infinite cycle of *Update measurements + image*, giving the feeling of a real time stream of data, especially if the baud rate of the connection is set to the maximum. While this logic is active, all other elements of the GUI window are disabled. Press

again this button to stop the infinite cycle and enable navigation through the interface.

4.5. Application 2 page

This screen (shown in Figure 8) shows all the necessary functions for Application 2. As all Application screens, it can be split into two parts: the application specific settings on the left and the image on the right.

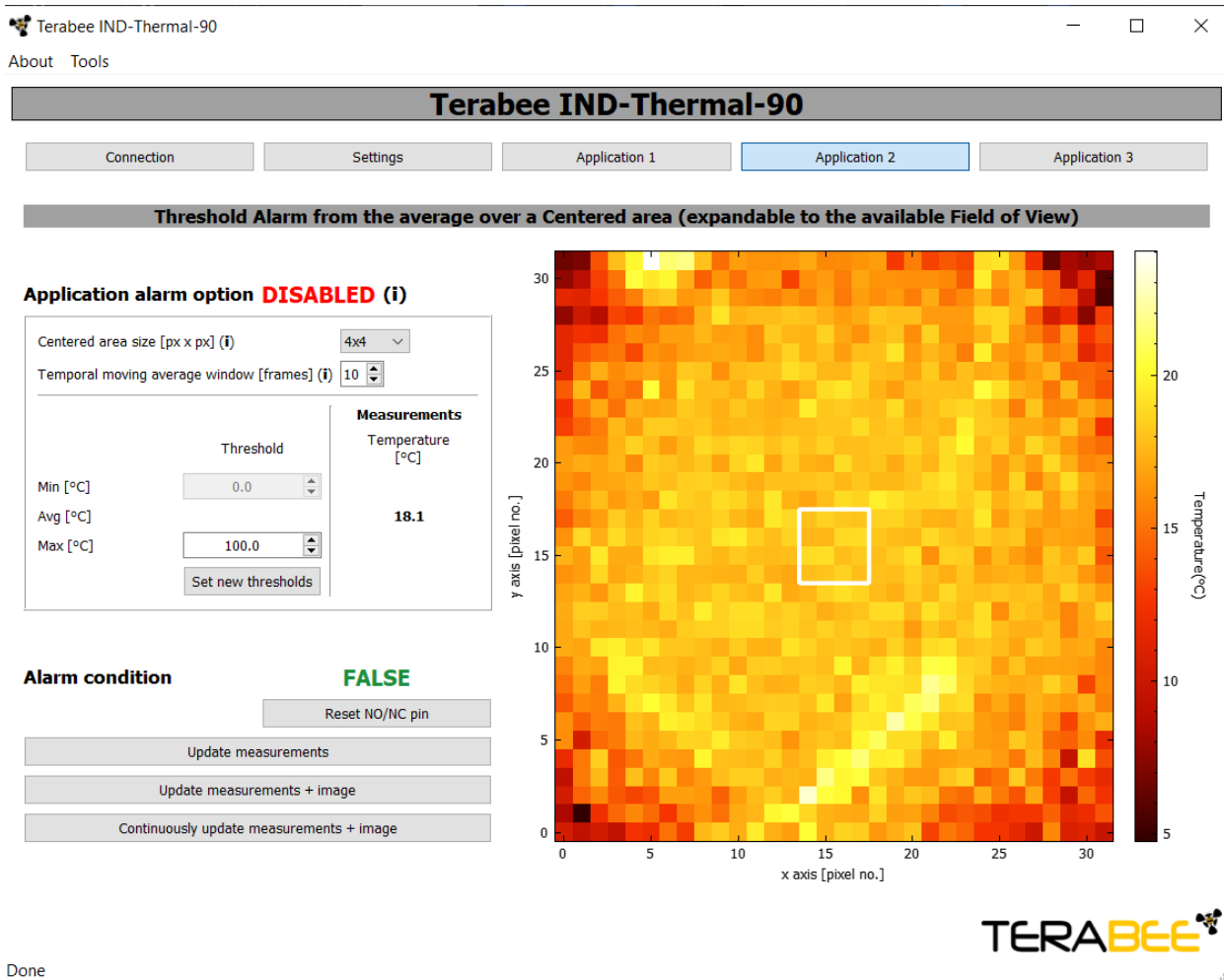


Figure 8. Application 2 tab

Starting from the settings on the left, the elements are as follows:

- Application alarm option ENABLED/DISABLED - status text based on the selected settings in the Settings page. If the application's alarm is enabled, this text will read Application alarm option ENABLED (enabled in green color), otherwise Application alarm option DISABLED (disabled in red color).
- Centered area size [px x px] - this scroll down menu allows adjusting the parameter which will modify the size of the target square, shown as a white contour over the

image on the right. The application's logic will only average the pixels contained within that area. Changing this setting corresponds to writing to the Holding Register at address 10 (Application 2 centered area size).



The white contour will update with the next image request, done by pressing the Update measurements + image button.

- **Temporal moving average window [frames]** - this input text defines the parameter used to establish the size of the moving average used by the application. The value range is 1-16. A lower value will improve the response time and increase the noise, while a higher value will decrease noise considerably, but increase the response time. Changing this parameter corresponds to writing to the Holding Register at address 11 (Application 2 moving average size). Press ENTER to save the value.
- **Threshold temperatures**
 - **Min[°C]** - this input field setting defines the minimum (cold) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Cold* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 5 (Application 2 cold threshold).
 - **Avg[°C]** - on this row, in the *Measurements* field, the current measured temperature within the target area is shown.
 - **Max[°C]** - this input field setting defines the maximum (hot) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Hot* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 4 (Application 2 hot threshold).
 - Set new thresholds - press this button to send the limit values currently shown in the *Min[°C]* and *Max[°C]* fields to the device.
- **Measurements**
 - **Temperature [°C]** - this field represents the measured temperature (averaged spatially based on the size of the target area and temporally based on the number of frames to be averaged) in the target area. This value is taken from the Input Register at address 24 (Application 2 temperature) and converted to degrees Celsius.
- **Alarm condition TRUE/FALSE** - this field shows the status of the application. If this flag is set to TRUE (red color), it means that there is a breach of the threshold temperature and, if the application's alarm is enabled, it will activate the electrical NO/NC pin. This value is taken from the Discrete Input at address 3 (Application 2 alarm triggered).

- **Reset NO/NC pin** - pressing this button will write FALSE to the Input Coil at address 11 (Clear NO/NC) and will deactivate the electrical NO/NC pin. This function is used when the *NO/NC timer based* parameter is set to FALSE and thus requires manual reset.
- **Update measurements** - pressing this button will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status). This is a fast operation and will not update the image.
- **Update measurements + image** - pressing this button will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status) and the image. This is a slow operation and requires over 10 Modbus requests.
- **Continuously update measurements + image** - pressing this button will trigger an infinite cycle of *Update measurements + image*, giving the feeling of a real time stream of data, especially if the baud rate of the connection is set to the maximum. While this logic is active, all other elements of the GUI window are disabled. Press again this button to stop the infinite cycle and enable navigation through the interface.

4.6. Application 3 page

This screen (shown in [Figure 9](#)) shows all the necessary functions for Application 3. As all Application screens, it can be split into two parts: the application specific settings on the left and the image on the right.

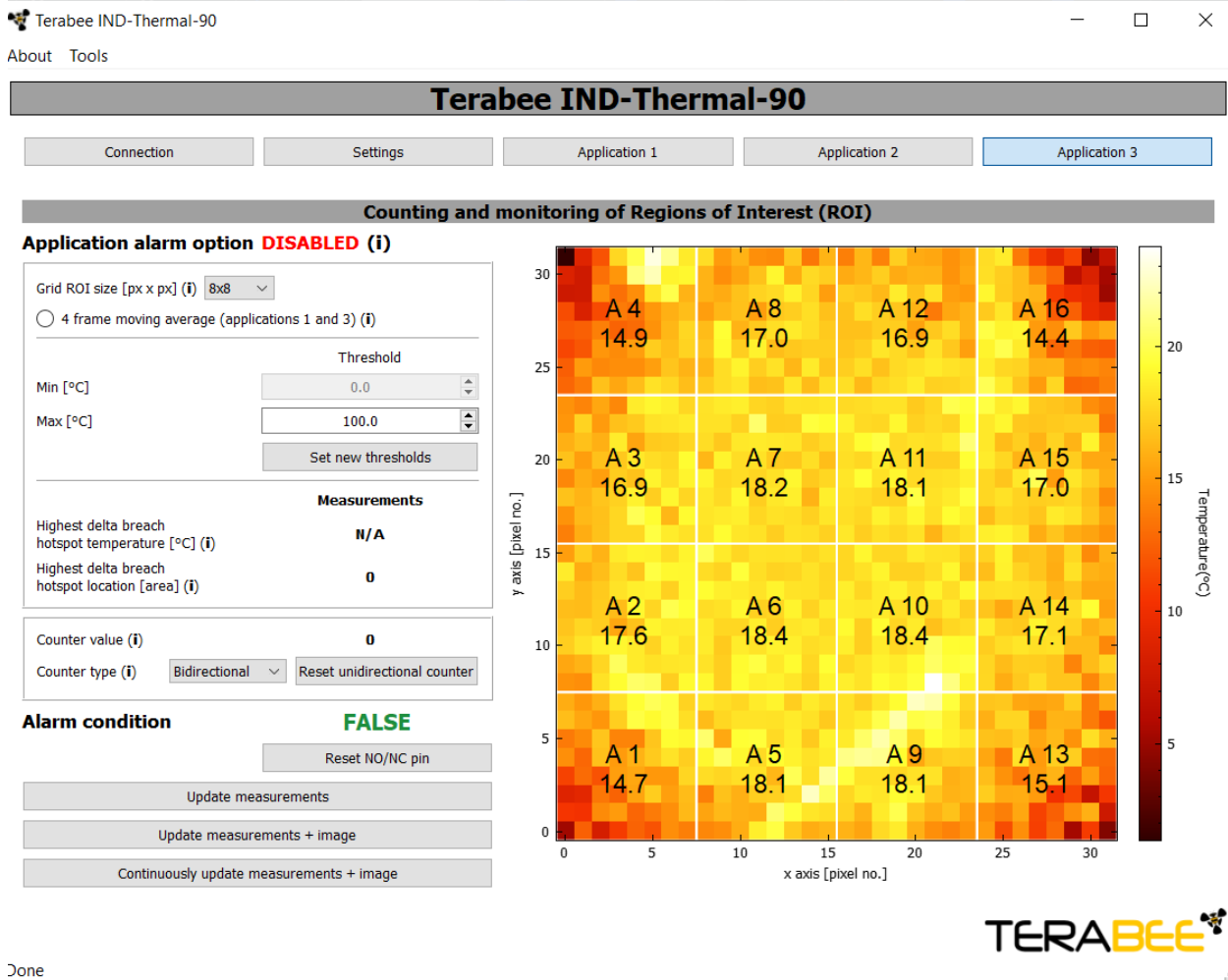


Figure 9. Application 3 tab

Starting from the settings on the left, the elements are as follows:

- **Application alarm option ENABLED/DISABLED** - status text based on the selected settings in the Settings page. If the application's alarm is enabled, this text will read Application alarm option ENABLED (enabled in green color), otherwise Application alarm option DISABLED (disabled in red color).
- **Grid ROI size [px x px]** - this scroll down menu allows adjusting the parameter which will modify the size of the Regions of Interest (ROIs). The ROIs are highlighted in white on the image, with some text in the middle in the following format "A %x %t" where %x stands for the number of the area i.e. A1 is area 1, and %t is the temperature of the area in degrees Celsius. The temperature values are taken from the Input Registers starting at address 25 up to address 280 (Application 3 ROI temperature).



The white contour and temperature info will update with the next image request, done by pressing the Update measurements + image button

- **4 frame moving average (applications 1 and 3)** - checking this button will enable a 4 frame temporal moving average for applications 1 and 3. The moving average will smoothen the image, reducing some of the noise. Changing this setting corresponds to writing TRUE or FALSE to the Input Coil at address 10 (Application 1 and 3 moving average).
- **Threshold temperatures**
 - **Min[°C]** - this input field setting defines the minimum (cold) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Cold* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 7 (Application 3 cold threshold).
 - **Max[°C]** - this input field setting defines the maximum (hot) threshold temperature for the application. The value range is -20 to +670 °C. This setting is only active when the *Temperature Choice* is set to either *Hot* or *Hot and Cold*. After writing the desired limit, press *Set new thresholds* to send them to the device. Changing this setting corresponds to writing the value in decikelvin to the Holding Register at address 6 (Application 3 hot threshold).
 - **Set new thresholds** - press this button to send the limit values currently shown in the *Min[°C]* and *Max[°C]* fields to the device.
- **Measurements**
 - **Highest delta breach hotspot temperature [°C]** -this field represents the temperature recorded in the area with the highest temperature difference to the thresholds. For example, if the *Temperature Choice* is set to *Hot and Cold* and the cold threshold is 10°C, hot threshold is 50°C, and one area has a recorded temperature of 65°C, and another a temperature of -10°C, this field will show -10°C, since the absolute delta between 10 and -10 is 20, whereas between 50 and 65 it is only 15. This value is taken from the Input Register at address 21 (Highest delta breach hotspot temperature).
 - **Highest delta breach hotspot location [area]** - this field represents the area that corresponds to the *Highest delta breach hotspot temperature [°C]* i.e. a value of 5 in this field means that the temperature example given for the point above would be found in the fifth area. Therefore, the area on the image should read as follows "A 5 -10.0". This value is taken from the Input Register at address 22 (Highest delta breach hotspot coordinates as expressed by registers "Application 3 hotspot location")
- **Counter value** - this value represents the current counter value as expressed by the Input Register at address 23 (Application 3 Hotspot counter). If the *Counter type* is set to *Bidirectional*, this value will represent the amount of areas currently exceeding the limit temperatures.
- **Counter type** - changing this parameter will alter the behavior of the counter, switching it between *Bidirectional* and *Unidirectional*. This change corresponds to writing TRUE or FALSE to the Input Coil at address 4 (Application 3 uni-directional counter).

- **Reset unidirectional counter** - pressing this button will reset the unidirectional counter to 0. This action is needed in order to refresh the counter, which will stop incrementing once it reaches 65535. Pressing this button corresponds to writing TRUE to the Input Coil at address 12 (Application 3 reset uni-directional counter).
- **Alarm condition TRUE/FALSE** - this field shows the status of the application. If this flag is set to TRUE (red color), it means that there is a breach of the threshold temperature and, if the application's alarm is enabled, it will activate the electrical NO/NC pin. This value is taken from the Discrete Input at address 4 (Application 3 alarm triggered).
- **Reset NO/NC pin** - pressing this button will write FALSE to the Input Coil at address 11 (Clear NO/NC) and will deactivate the electrical NO/NC pin. This function is used when the *NO/NC timer based* parameter is set to FALSE and thus requires manual reset.
- **Update measurements** - pressing this button will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status). This is a fast operation and will not update the image.
- **Update measurements + image** - pressing this button will read and update the application inputs (measured min/max pixel temperatures and coordinates, average temperature, alarm status) and the image. This is a slow operation and requires over 12 Modbus requests. This action will also update the area values.
- **Continuously update measurements + image** - pressing this button will trigger an infinite cycle of *Update measurements + image*, giving the feeling of a real time stream of data, especially if the baud rate of the connection is set to the maximum. While this logic is active, all other elements of the GUI window are disabled. Press again this button to stop the infinite cycle and enable navigation through the interface.