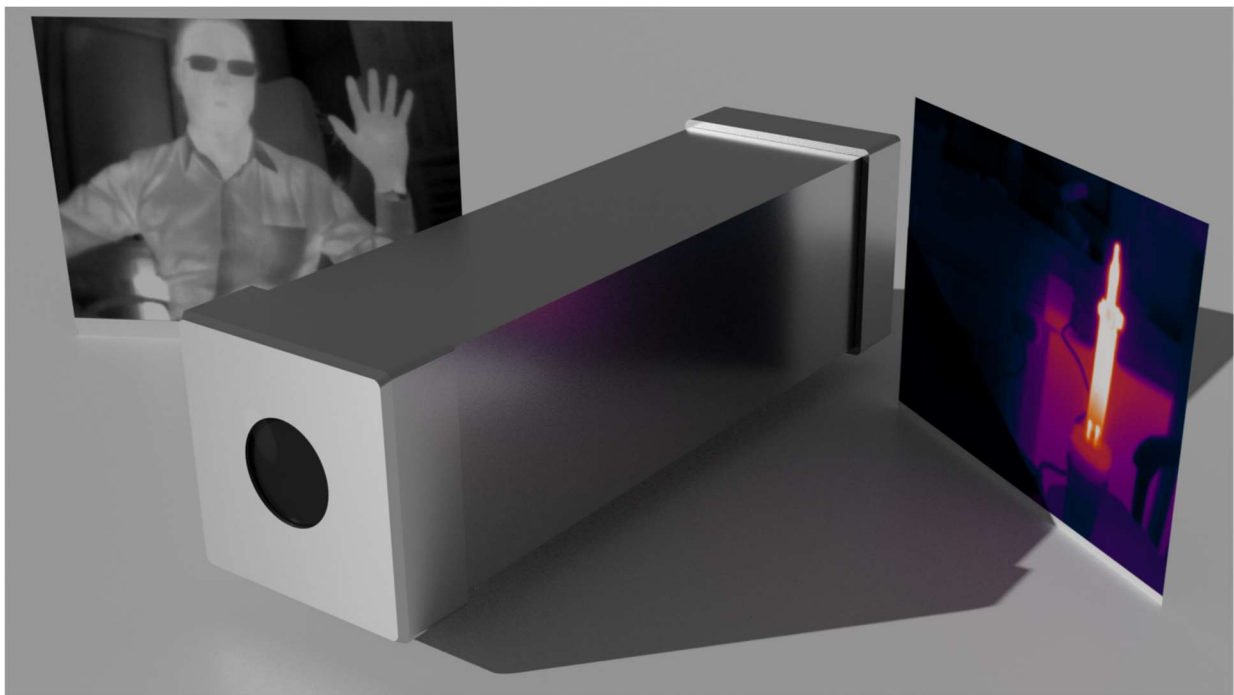




## User Manual ThermoCam EMCTC



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**Program Status:**

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Hardware EMCTC-320 (02.03.2023)  
Software: AVT-ThermoCam V1.00 (01.03.2023)

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## List of abbreviations

EMC	Electro-Magnetic Compatibility
EMV	Elektro-Magnetische Verträglichkeit
FC/PC	Fiber Connector / Physical Contact
PC	Personal Computer
USB	Universal Serial Bus
IRT	Infrared Thermography
FOC	Fiber Optic Cable

## Introduction

With the infrared thermography (IRT) camera EMCTC, 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 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 one of our EMC-proof power supplies. Mechanically, there is a connection for standard tripods or two M5 screw connections.

The electromagnetic **emissions** of the EMCTC IRT 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 EMCTC IRT camera 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 movable focal lengths are as follows:

<b>Focal length /mm</b>	<b>2,2</b>	<b>4</b>	<b>6,6</b>	<b>9,1</b>
Aperture	1,05	1,00	1,26	1,00
Horizontal opening angle	105°	56°	34°	24°
Vertical opening angle	75°	42°	25°	18°
Areas according to Johnson criteria				
Detection range/m	186	333	543	758
Detection area/m	46	83	136	190
Identification area/m	27	48	78	108
	On request			

Further technical data and explanations can be found in section 5.

## 1. Operating Conditions and Safety Instructions

The EMCTC thermal imaging camera is designed for indoor applications only. For outdoor applications, please contact the manufacturer (AVT). The permissible ambient temperature and humidity must be observed. Although high temperatures can be measured, 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.

If the fiber optic cables are fed through larger 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. 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 IRT camera, 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), an EMC-proof 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 Fig. 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 manual is either enclosed or provided online for download.

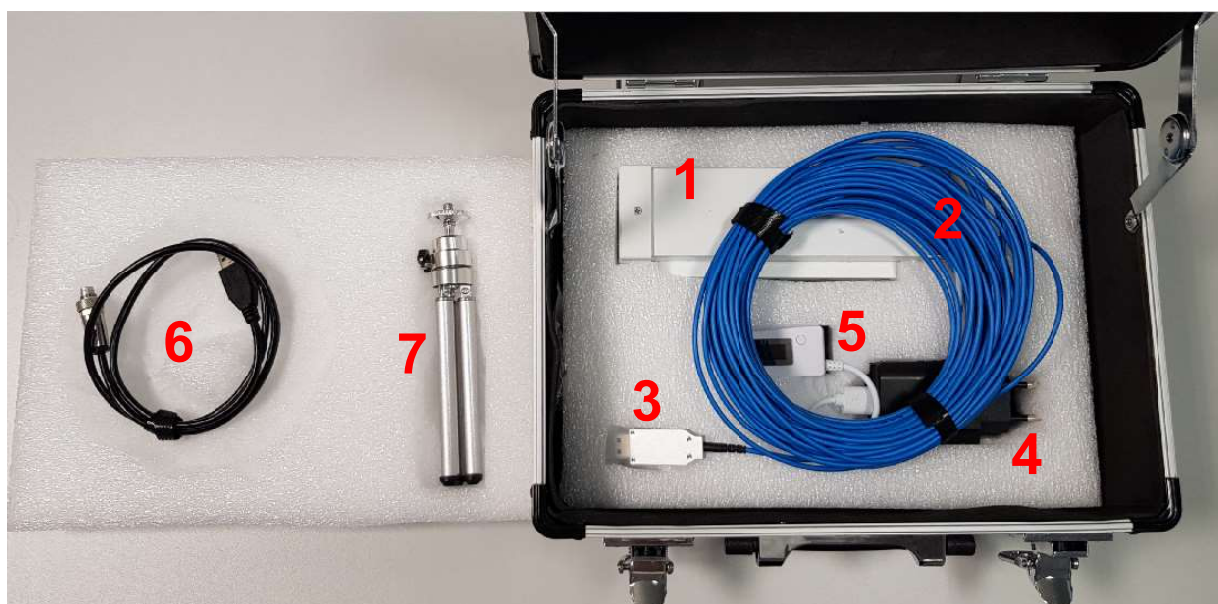


Fig 1: Standard scope of delivery of the IRT camera AVT\_EMCTC

1. Thermal imaging camera ThermoCam
2. Kevlar reinforced foc 10m, min. bending radius 30 mm
3. USB 3.0 standard A plug
4. Battery charger,  $U_{in} = 100 \dots 240 \text{ V}$ ,  $U_{out} = 5\text{V}$ ,  $I_{max} = 2.0 \text{ A}$
5. Charging monitor with voltage and current display (color may vary)
6. Charging connection cable for camera
7. Extendable mini tripod (optional)

**Content may vary depending on the order of optional components!**

Other:

Case as protective packaging

Key for metal case inside for internal use (optional)

### 3. Assembly/Use

To use the IRT camera, 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.

#### High field strength option only

For increased field strength requirements, separation points are inserted for the camera and EMC cabin walls. For this purpose, FC/PC bushings are used within the transmission path. The transmission path is Camera → FC/PC → FOC → FC/PC bushing → FOC → USB. The FOCs of the same color must always be connected to each other at the bushings (blue – blue, orange – orange). Then the FOCs are connected to the camera. The designations "transmitter" and "receiver" (the camera's point of view) on the back of the camera are shown in the colors of the FOCs (see Fig. 2). Thus, the blue fiber optic cable is to be connected on the left and the red one on the right. When connecting, the inner connections are first inserted and twisted until they can be pushed in further and snap into place (twisting is no longer possible). Then the outer screw connections can be tightened. The screwed connections are shown in Fig. 2.



Figure 2: Rear side of the IR thermography camera with its connectors

After connecting the cable, the USB plug is inserted into a USB 3 socket (blue) of the PC or laptop to operate the camera (Fig. 3).



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

The power supply for the fiber optic connector is provided by the PC/laptop (5V/0.58 W). After checking all connections, the camera can be switched on (ON/OFF). For the standard version of the camera, the toggle switch to the inside is switched on.

Option: For versions with pressure switch, the switched-on state is indicated with an LED.

Only high field strength option (FC/PC) with pressure switch without LED:

The state of the camera (ON or OFF) can be uncertain because this option does not have an external LED. It can be also the case that the camera is not connected to a PC/laptop to check the state. In such cases, the fastest and best way to check the state is with the camera of a mobile phone (cell phone) (Fig.4).



Figure 4: State of the IR thermography camera (left ON, right OFF).

After switching on, the camera is reported with its number in the software. All further settings are available and can be adjusted in the software.

#### 4. Charging the Battery

If the camera is used in battery mode, 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 (Fig. 5). The correct contact is only ensured when the plug is completely screwed in!





Figure 5: Charging port of the IR thermography camera

The charging voltage and the charging current can be observed if the charging adapter cable (6) is connected to the battery charger power pack (4) via the charging monitor measuring device (5). (Fig. 6).



Figure 6: Measuring device for loading the IR thermography camera

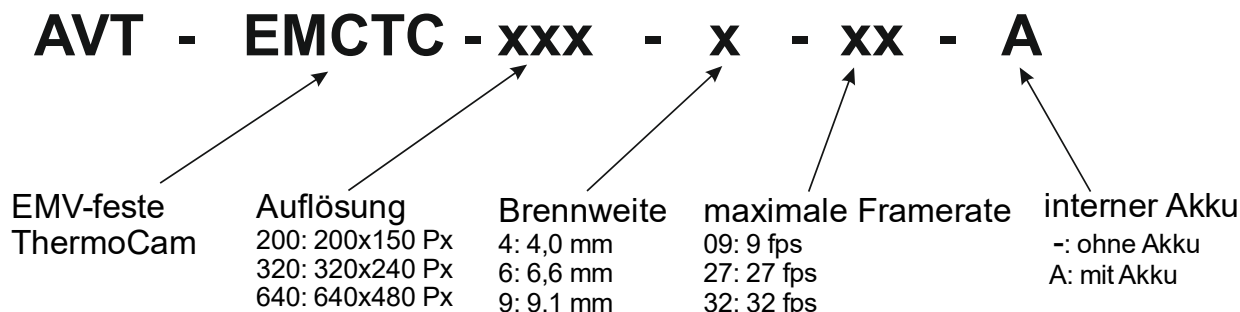
The current values for voltage and current flow can be read on the display. Furthermore, the accumulated charge is measured. The charge display is reset by pressing the button. If the current flow drops from a value above 0.9 A to 0 or almost 0 during charging, the battery is charged. If this value stays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

## 5. Technical Specifications

Brennweitenauswahl	4	6	9
<b>Optik</b>			
Brennweite	4,0 mm	6,6 mm	9,1 mm
Apertur	1,00	1,26	1,00
Detektionsbereich <sup>1</sup>	333 m	543 m	758 m
Identifikationsbereich <sup>1</sup>	48 m	78 m	108 m
<b>für Sensorauflösung 320 x 240</b>			
horizontaler Öffnungswinkel	56°	34°	24°
vertikaler Öffnungswinkel	42°	25°	18°
<b>für Sensorauflösung 200 x 150</b>			
horizontaler Öffnungswinkel	35°	21°	15°
vertikaler Öffnungswinkel	26°	15°	12°
<b>Allgemeine Daten</b>			
Spektrale Empfindlichkeit	7,8 µm ... 14 µm		
Temperaturbereich der Kameraerfassung	-40°C ... 330°C		
Temperaturgenauigkeit	±5°C(-40°...100°), ±5%(100°...140°C), ±10%(>140°C)		
Framerate (Sensor 200x150 / 320x240)	9 oder 32 fps / 9 oder 27 fps		
Daten- und Steueranschluss	USB 3.0		
<b>Elektrischer Anschluss</b>			
Versorgungsspannung (Gleichspannung)	min 4,8 V	max 5,5 V	
Energieverbrauch (Kamera keine Akkuladung)	2 W	2,5 W	
Stromfluss (bei Betrieb / Ladung Akku / bei Betrieb und Ladung)	0,36 / 0,0 / 0,36 A	0,45 / 2,0 / 2,45 A	
<b>Abmessungen</b>			
Länge der Kamera ohne Anschlüsse	186 mm		
Breite	54 mm		
Höhe (mit Fuß)	54 mm (64 mm)		
Gewicht	850 g		

<sup>1</sup> Basis sind "Johnson criteria"

## Order Information



**Beispiel: AVT-EMCTC-320-4-27-A**

## 6. Operation of the Software

When installing the software, the necessary drivers are installed, with which the connection to the camera can be established. When the optical converter is connected to USB 3 and the camera is switched on, it is recognized in the software. Each camera has a unique number, with which the software can also distinguish between different cameras.

### 6.1 Installation of AVT ThermoCam software

1. Download the software.
2. Open the software directory.
3. Double click on setup or AVT\_thermoCam\_install to start the installation.
4. Open the AVT ThermoCam program, connect the ThermoCam and switch it on.

### 6.2 Main areas of the AVT ThermoCam software

The ThermoCam can be grouped into six main areas or twelve different sections and subsections (Fig. 7). Below you will find a description of the six main sections and their location:

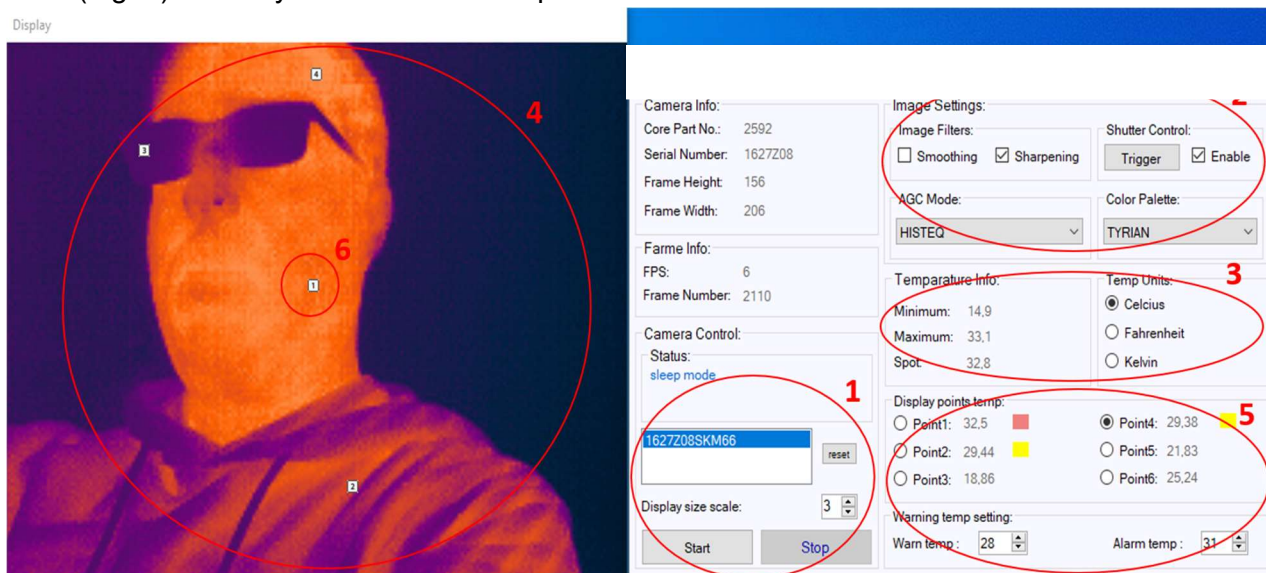


Figure 7: Software interface of the AVT thermography camera

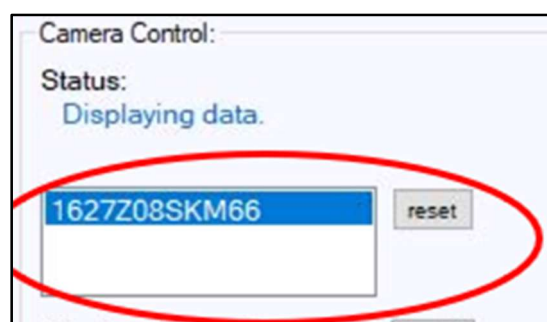
1. In the "Cameras" section, the camera sensors are detected if they are connected to the USB ports of the PC and the drivers are properly installed. Select a camera from the drop-down list and click the "Start" button in the "Camera Control" section to connect to, query, control and take a picture of the camera.
2. Here the image settings of the camera can be selected or adjusted via the program. There are controls such as AGC mode, color palette, image filter and shutter control as well as some basic filters. These settings can be used to optimize or adjust the image of your AVT thermal imaging camera depending on the application.
3. This displays the calculated temperatures for the scene minimum, scene maximum and the spot in the center of the image that are currently in the scene. To change the

temperature unit, simply switch to the "Temperature Units" area and select an option from the radio button.

4. In this area of the ThermoCam, the camera image is displayed in the color palette and AGC mode, as well as in user-configurable parameters. In this area the temperature of different points is displayed. In the undefined case, the position of all points is 0, 0.
5. In this section the temperature of the different points is displayed. In the undefined case, the position of all points is 0, 0. Also, the user can set the maximum warning and alarm level.
6. Here you can see the position of the points that the user clicked on the screen

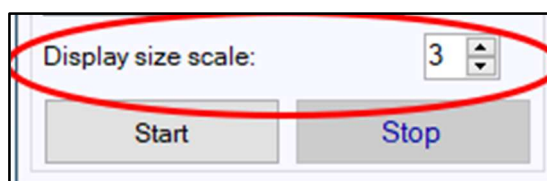
#### 6.2.1 Camera control

This is a list of available and recognized ThermoCam devices by serial number. Select a camera from the list, which will be highlighted in blue. After selection, press Start in the Camera Control section to connect the AVT ThermoCam device and display an image. If you do not see your connected camera, press the Reset button.



#### 6.2.2 Display size of the thermal image

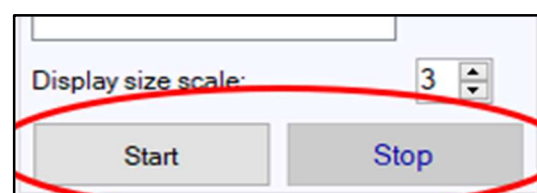
Before starting the camera, you can select the display size of the thermal image based on the multiple of the original image size. For each change, you must stop the camera, change the scale and start the camera again.



#### 6.2.3 Start/Stop

Once a camera is selected, it can be started to control, acquire data and display the image of the ThermoCam.

- Press the Start button to connect to the selected camera and start the display.
- Press the Stop button to activate the pause mode and stop imaging the connected camera.



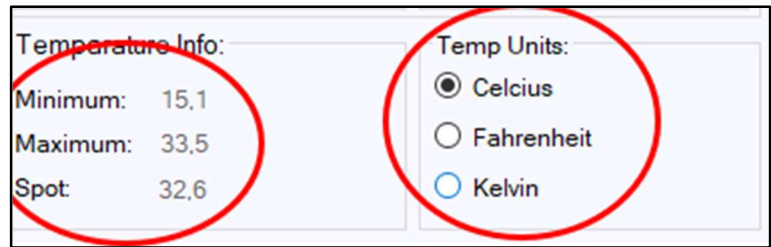
#### 6.2.4 Camera Information

Here you will find general information about the camera, such as the camera number, the serial number and the original size of the image. This information becomes available as soon as the camera is connected and started.



### 6.2.5 Temperature units

Choose from 3 different temperature units. Minimum, maximum and spot values are displayed in the center right of the application.



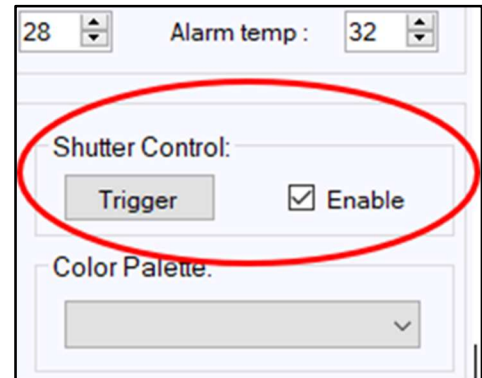
### 6.2.6 Camera and image settings

In this section you will find variants of the image settings. To control the AGC algorithms or to adjust the color representation in the display, etc.

#### Shutter setting

The ThermoCam enables automatic shutter control.

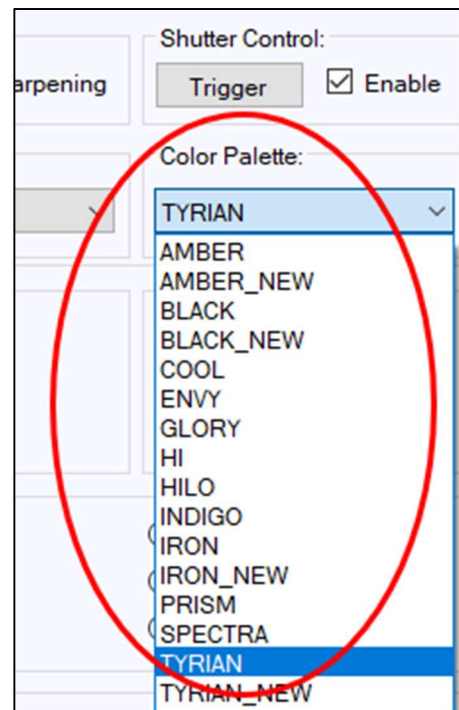
- The Enable check box activates or deactivates the automatic shutter.
- Press the trigger button to release a shutter at any time.



**Advice:** It is strongly recommended to always activate the automatic shutter. This will correct any deviation in the gain of the pixels.

#### Color palette

The ThermoCam software provides a variety of color palettes to choose from for image display. Some popular palettes are TYRIAN\_NEW, WHITE\_NEW, BLACK\_NEW and IRON\_NEW. The color palettes are hardwired to the AGC mode and parameter settings. Changing settings in one palette may have a completely different effect in another palette.



### AGC Modus

The ThermoCam- The software offers 3 different automatic gain control (AGC) algorithms that can be used to map the camera data (see Fig. 8).

- LEGACY\_HISTEQ is a fixed histogram based AGC algorithm.
- LINEAR is a linear AGC algorithm mode.
- HISTEQ is a histogram-based AGC algorithm.

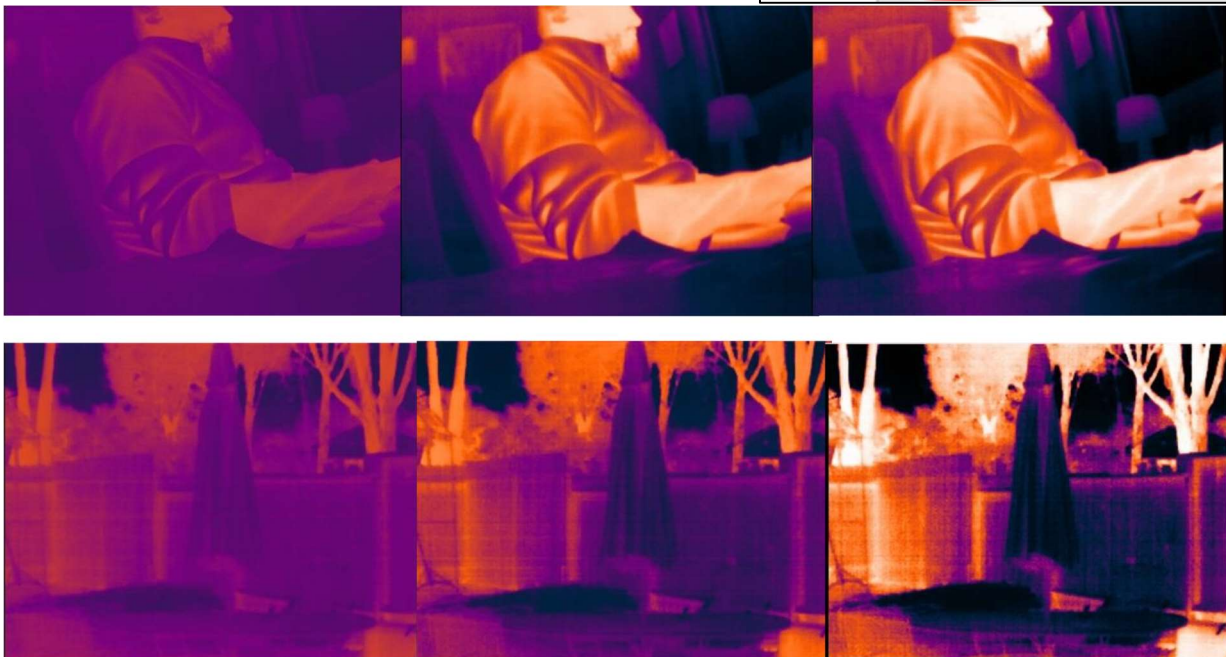
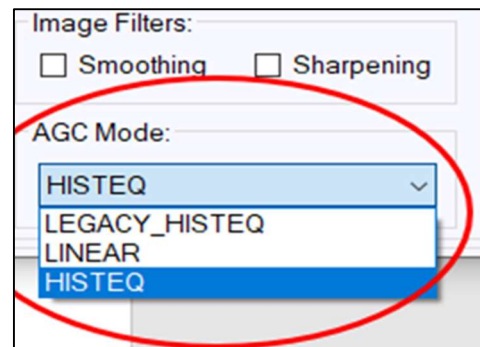
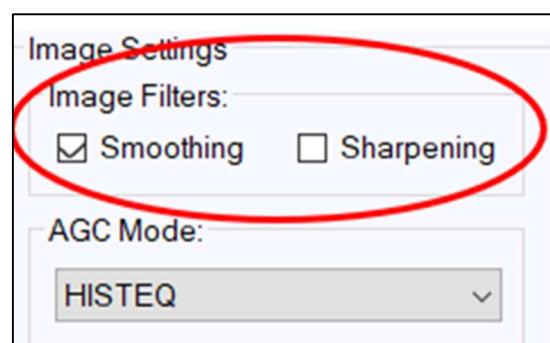


Figure 8: AGC mode changes in examples

### Filtering: smoothing and sharpening

The ThermoCam software offers the possibility to activate and deactivate some different filters.

- The Smoothing checkbox enables or disables the smoothing function that gives the image smooth edges and helps with scene movement (it is recommended to enable smoothing).
- The Sharpen checkbox activates and deactivates the sharpening function, which gives the image sharper and more pixelated edges.



### 6.2.8 Display of the temperature measuring points

To measure the temperature of different points of the image, you can select one of the options buttons and click on the image. The user can see the temperature of 6 points simultaneously in this area (see example in Fig. 9).

Display points temp:					
<input type="radio"/>	Point1: 32,63	<span style="color: red;">■</span>	<input checked="" type="radio"/>	Point4: 31,36	<span style="color: red;">■</span>
<input type="radio"/>	Point2: 28,54	<span style="color: yellow;">■</span>	<input type="radio"/>	Point5: 21,36	
<input type="radio"/>	Point3: 19,66		<input type="radio"/>	Point6: 21,3	

Figure 9: Activated measuring points in the thermal image



### 6.2.9 Overtemperature warning/alarm

In this area, the user can set the maximum temperature at which a warning or alarm should be displayed. These temperatures generate yellow (warning) or red (alarm) fields behind the temperature measurements when the set temperature is exceeded. The numerical values are indicated in the respective temperature unit.

Warning temp setting:					
Warn temp :	28	▲▼	Alarm temp :	31	▲▼

## Modification History

### Version

0.01	Initial creation of the document (23.03.2021)
0.02	Extension of the document (05.09.2022)
1.00	Extension of the document (10.06.2022)
1.01	Extension by software description (02.03.2023)
1.02	QR code added (27.03.2023)

## Contact details

AVT GmbH  
 Automatisierungs- und Verfahrenstechnik  
 Am Hammergrund 1  
 98693 Ilmenau  
 Deutschland  
 Tel: +49 (0)3677 6479-56  
 Web: [www.avt-ilmenau.de](http://www.avt-ilmenau.de)  
 Mail: [info@avt-ilmenau.de](mailto:info@avt-ilmenau.de)

### Product website



### Download website



Errors and omissions excepted