AC060V

EN

OPERATING MANUAL
THERMAL IMAGING CAMERA

> TROTEC

TROTEC

Table of contents

Notes regarding the operating manual

Symbols

Warning of electrical voltage
This symbol indicates dangers to the life and health of persons due to electrical voltage.

Warning
This signal word indicates a hazard with an average risk level which, if not avoided, can result in serious injury or death.

Caution
This signal word indicates a hazard with a low risk level which, if not avoided, can result in minor or moderate injury.

Note
This signal word indicates important information (e.g. material damage), but does not indicate hazards.

Info
Information marked with this symbol helps you to carry out your tasks quickly and safely.

Follow the manual
Information marked with this symbol indicates that the operating manual must be observed.

You can download the current version of the operating manual and the EU declaration of conformity via the following link:

AC060V

https://hub.trotec.com/?id=42959

Safety

Read this manual carefully before starting or using the device. Always store the manual in the immediate vicinity of the device or its site of use!

Warning
Read all safety warnings and all instructions.
Failure to follow the warnings and instructions may result in electric shock, fire and / or serious injury.
Save all warnings and instructions for future reference.
This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

- Do not use the device in potentially explosive rooms.
- Do not use the device in aggressive atmosphere.
- Do not immerse the device in water. Do not allow liquids to penetrate into the device.
- The device may only be used in dry surroundings and must not be used in the rain or at a relative humidity exceeding the operating conditions.
- Protect the device from permanent direct sunlight.
- Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in legible condition.
- Do not open the device.
- Observe the storage and operating conditions as given in the Technical data chapter.

Intended use

Only use the device for visual or thermographic representation of objects whilst adhering to the technical data.

To use the device for its intended use, only use accessories and spare parts which have been approved by Trotec.

Improper use

Do not use the device in potentially explosive areas. Never use the device on persons or animals. Trotec accepts no liability for damages resulting from improper use. In such a case, any warranty claims will be voided. Any unauthorised modifications, alterations or structural changes to the device are forbidden.

Personnel qualifications

People who use this device must:
- have read and understood the operating manual, especially the Safety chapter.

Residual risks

Warning of electrical voltage

There is a risk of a short-circuit due to liquids penetrating the housing!
Do not immerse the device and the accessories in water. Make sure that no water or other liquids can enter the housing.

Warning of electrical voltage

Work on the electrical components must only be carried out by an authorised specialist company!

Warning of electrical voltage

Before any work on the device, remove the mains plug from the mains socket and the battery from the device! Hold onto the mains plug while pulling the power cable out of the mains socket.

Warning of explosive substances

Do not expose the battery to temperatures above 45 °C! Do not let the battery come into contact with water or fire! Avoid direct sunlight and moisture. There is a risk of explosion!

Warning

Risk of suffocation!
Do not leave the packaging lying around. Children may use it as a dangerous toy.

Warning

The device is not a toy and does not belong in the hands of children.

Warning

Dangers can occur at the device when it is used by untrained people in an unprofessional or improper way! Observe the personnel qualifications!

Caution

Lithium-ion batteries might catch fire in case of overheating or damage. Ensure a sufficient distance to heat sources, do not subject lithium-ion batteries to direct sunlight and make sure not to damage the casing. Do not overcharge lithium-ion batteries. Only use smart chargers that switch off automatically when the battery is fully charged. Charge lithium-ion batteries in due time before they are discharged completely.

Caution

Keep a sufficient distance from heat sources.

Note

To prevent damages to the device, do not expose it to extreme temperatures, extreme humidity or moisture.

Note

Do not use abrasive cleaners or solvents to clean the device.

Information about the device

Device description

The thermal camera AC060V creates a visible image depicting infrared radiation, which is otherwise invisible to the human eye. The thermal image and temperature are displayed on the screen in real time. To improve the view, you can select various colour palettes for depicting the thermal image.

You are also able to automatically find and display the warmest and coolest measuring spot in the measured image.

For a measured result which is as precise as possible the ambient temperature, relative humidity, distance and emissivity can be entered.

A list of emissivities for various surfaces is provided in the chapter Emissivity.

For a precise evaluation, the thermal image on the screen can be recorded and saved on the device.

The device control is based on the Android operating system for tablets.

The saved images can either be viewed directly on the screen or transferred to a PC with the supplied USB cable.

To edit the images, you can download the IR-Report 2.X STD software from the download (or service) section of www.trotec.com.

> **Info**
>
> This operating manual only describes the operation of the IR app for the AC060V. Further functions of the tablet or the Android operating system are not a part of this manual.

Additionally, to create short reports relating to the images, you can use the app IR-Wizard available free of charge. This software is a complimentary bonus that does not belong to the standard scope of delivery and is offered for use without support or warranty. The program interface (only available in selected languages) is generally easily comprehensible and can be used intuitively. Further information regarding the use is provided in the application.

Device depiction
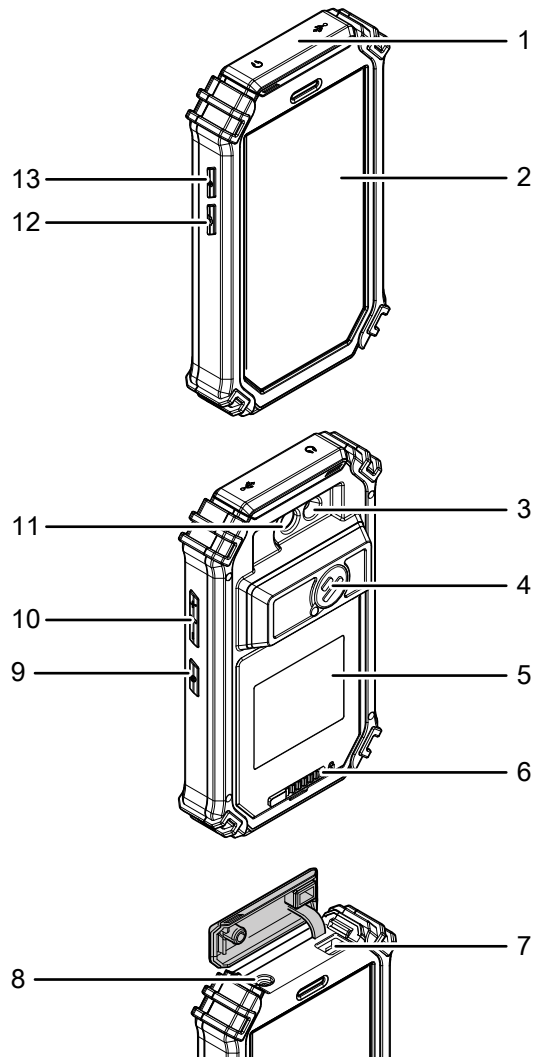
No.	Operating element
1	Protective cover for micro USB and headphone connection
2	Touchscreen
3	LED illumination
4	Protective cover / camera lens
5	Battery compartment with cover
6	Locking mechanism for the battery compartment
7	USB port
8	3.5 mm headphone connection
9	Power button
10	Volume control button
11	Camera (visual)
12	Photo button (IR image)
13	Shutter button

Technical data

Parameter		Value
Model		AC060V
Article number		3.110.003.030
Measurement	Temperature range	-20 °C to +160 °C
	Accuracy	± 2 °C, ± 2 % from the measured value
Radiometric image performance	Detector type	UFPA
	Detector resolution	80 x 80 pixels
	Spectral range	8 to 14 µm
	Field of vision (FOV)	21° x 21°
	Geometric resolution	4.1 mrad
	Thermal sensitivity	≤ 0.1 °C at 30 °C
	Refresh rate	50 Hz
	Focus / min. focus distance	Rigid / 0.5 m
Visual image performance	Digital photo camera	8 megapixels, integrated photo lamp (LED)
	Video norm	PAL / NTSC
Image representation	Display	5.5-inch LCD touchscreen, capacitive
	Image display	Pseudo colours, 6 colour palettes (IR image); 16.7 million colours (real image)
	Image display options	IR image, IR video, real image
Measurement and analysis	Measuring points	3 dynamic temperature measuring points, individually configurable (MIN, MAX, ALARM)
	Measuring functions	Automatic min./max. temperature tracking (hot/cold spot), isotherm, sector analysis (line, circle, rectangle), alarm function
	Emissivity	User-defined variably adjustable from 0.01 to 1.0
	Measurement correction	Correction of the reflected object temperature; automatic correction based on user-defined specifications for ambient temperature, distance, relative humidity
System equipment	Operating system and functions	Operating system based on Android 4.2 with integrated thermal image analysis software, report generating function, IR video player, internet browser
	Interfaces	USB, WLAN, GPS, Bluetooth, 3.5 mm headphone output
Data storage	Memory	16 GB integrated and non-exchangeable SD card
	File format	Radiometric image: 14 bit JPEG; visual image: JPEG; non-radiometric thermographic video: MPEG-4
Power supply	Battery type	Standard, lithium-ion; rechargeable
	Operating time	≈ 2 h
Surrounding conditions and physical characteristics	Temperature	0 °C to +50 °C (operation), -25 °C to +55 °C (storage)
	Type of protection	IP54
	Shock / vibration	25 G / 2 G
	Dimensions	173 x 100 x 28 mm
	Weight	415 g

Scope of delivery

- 1 x Thermal camera AC060V
- 1 x Rechargeable battery, Li-ion
- 1 x Charger
- 1 x Charging cradle

- 1 x Changing adapter for different socket types
- 1 x USB cable
- 1 x Transport case
- 1 x Manual

Transport and storage

Note

If you store or transport the device improperly, the device may be damaged.
Note the information regarding transport and storage of the device.

Transport

For transporting the device, use the transport case included in the scope of delivery in order to protect the device from external influences.

The supplied Li-ion batteries are subjects to the requirements of dangerous goods legislation.

Observe the following when transporting or shipping Li-ion batteries:

- The user may transport the batteries by road without any additional requirements.

- If transport is carried out by third parties (e.g. air transport or forwarding company), special requirements as to packaging and labelling must be observed. This includes consulting a dangerous goods specialist when preparing the package.
    - Only ship batteries if their housing is undamaged.
    - Mask open terminals with tape and pack the battery in a way that it cannot move inside the packaging.
   - Please also observe any other national regulations.

Storage

When the device is not being used, observe the following storage conditions:

- dry and protected from frost and heat
- protected from dust and direct sunlight
- For storing the device, use the transport case included in the scope of delivery in order to protect the device from external influences.
- The storage temperature is the same as the range given in the Technical data chapter.
- When storing the device for an extended period of time, remove the battery/batteries.

## Operation

Operating elements (AC060V app only)
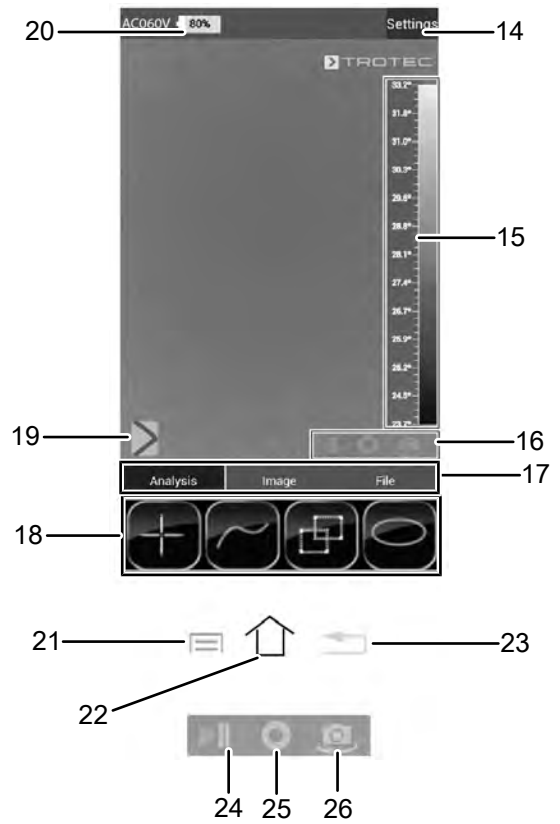
| No.	Operating elements
14	Settings menu button
15	Temperature scale
16	Camera control panel
17	Mode menu bar
18	Functions menu bar (example here: Analysis)
19	*Parameter* button
20	Charging status indicator
21	Menu button
22	Home button
23	Back button
24	Still image button
25	Calibration / automatic adjustment button
26	Button to change between IR camera and visual camera

Inserting / changing the battery

Note

Make sure that the surface of the device is dry and the device is switched off.
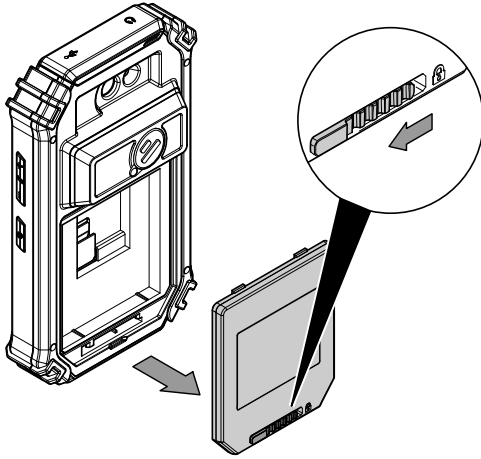
1. Slide the locking bar of the battery compartment to the left.
   ⇨ The battery compartment's lock is released.
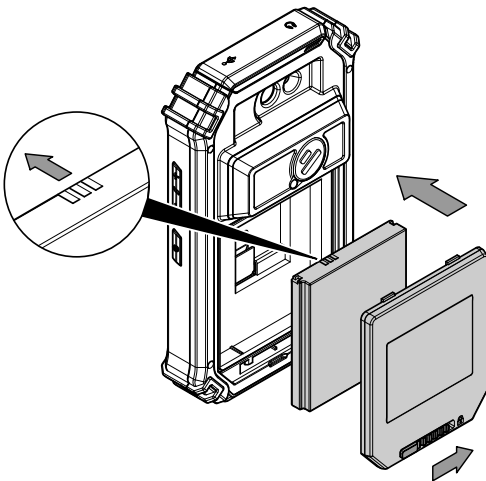
2. Remove the cover (5) from the battery compartment.
3. Insert the battery into the compartment as indicated in the above figure.
4. Reattach the cover (5) to the battery compartment.
5. Slide the locking bar to the right.
   ⇨ The battery compartment is closed and locked.

Start-up

1. Turn the protective cover (4) sideways to reveal the camera lens and to then start using the IR camera.
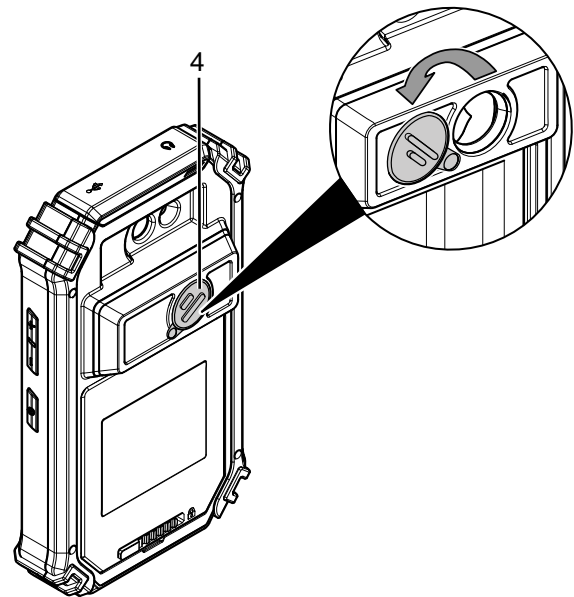
Switching the device on

1. Press the Power button (9) for approx. 3 seconds.
   ⇨ The display switches on.
   ⇨ The operating system boots up.
   ⇨ The device is ready for operation.

Setting the language

The app's language is controlled via the system settings of the Android operating system.

1. Call up the system settings. The system settings app has the following icon:

2. Find the menu item *Language & input*.
3. Set the desired language.
4. Press the Back button (23) to leave the system settings.

Setting the time and date

Time and date of the app are controlled via the system settings of the Android operating system.
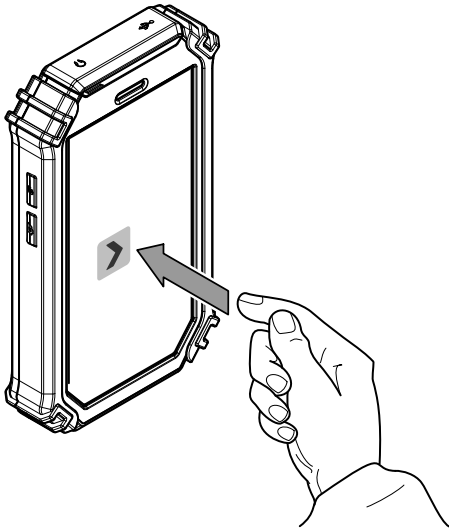
1. Call up the system settings. The system settings app has the following icon:

2. Find the menu item *Date & Time*.
3. Adjust the time and date as desired.
4. Press the Back button (23) to leave the system settings.

Starting the AC060V app

In order to use the IR camera first start the AC060V app via the Android user interface.

1. Touch the icon on the user interface.
   ⇨ The app starts.
   ⇨ The IR camera will be activated.
   ⇨ The thermal image will be displayed in real time.

Further information regarding the operation of the app can be found in the chapter AC060V app.

Calibrating the IR camera

1. Press the Shutter button (13).
   ⇨ The internal shutter of the IR camera closes briefly and an automatic adjustment (calibration) to the temperatures in the image section is performed.

You can also calibrate the IR camera via the AC060V app. To do so, please proceed as follows:

1. Start the AC060V app.
2. Press the Calibration button (25).
   ⇨ The internal shutter of the IR camera closes briefly and an automatic adjustment (calibration) to the temperatures in the image section is performed.
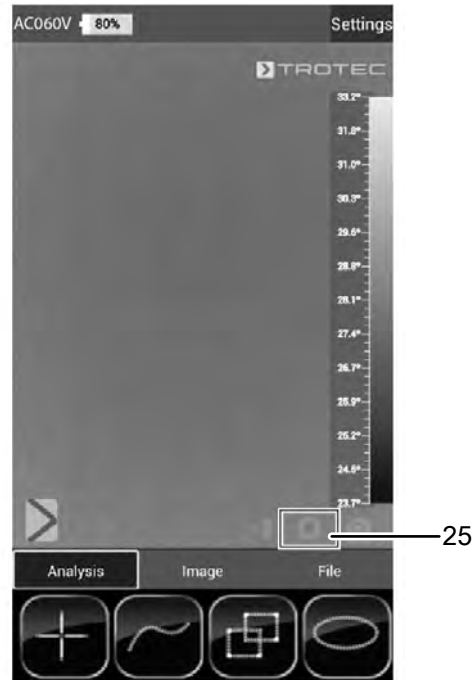
Taking / recording an infrared image or video

1. Start the AC060V app.
2. Change over to the *Image* or *Analysis* mode.
3. Point the camera at the object which you want to have a thermal image of.
4. Calibrate the IR camera (see Calibrating the IR camera).
5. Either press the Photo button (12) or the camera icon on the display (Image mode).
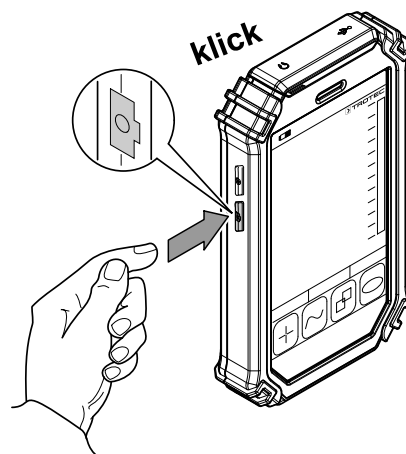
Data transfer via USB
1. Connect the supplied micro USB data cable to the device.
2. Connect the data cable to a PC or notebook.
3. If the camera is not recognized by the computer, select the function *use as data store* when prompted:
   ⇨ To do so, open the Android USB settings by swiping the screen from the top edge to the bottom.
   ⇨ After successful detection the camera is displayed in the file browser of your PC/notebook as removable storage device; from there files can be transferred.

Switching the device off
1. Press the Power button (9) for approx. 3 seconds.
2. Confirm the switch-off by pressing the button *Power Off*.
   ⇨ The device switches off.

AC060V app

Basic settings

In this menu you can set the automatic calibration and view information regarding the device.

Setting the automatic calibration

You can specify the time after which the camera carries out an automatic adjustment.
1. Press the *Settings* button (14).
   ⇨ The menu will be displayed.
2. Touch the selection *Auto Shutter Time*.
   ⇨ The submenu for setting the time for an automatic calibration will be displayed.
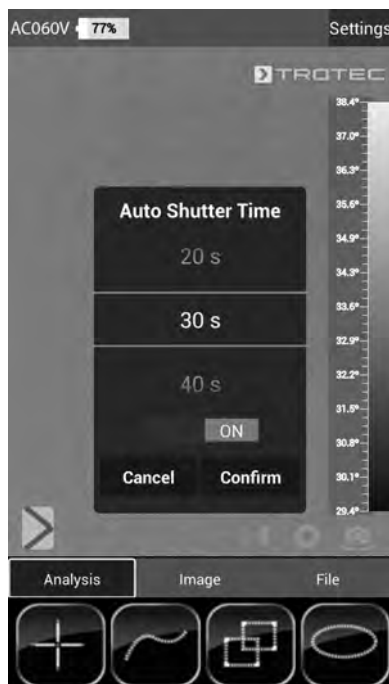
3. Select the desired time or disable automatic calibration.
4. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.

5. Press the Back button (23) to leave the menu.

Info
If the automatic adjustment function of the camera is deactivated, it needs to be calibrated manually at regular intervals during operation, particularly before taking a picture, as owing to its operating principle the IR detector drifts and the camera could consequently display incorrect temperature values!

Displaying device information
1. Press the *Settings* button (14).
   ⇨ The menu will be displayed.
2. Select *Device Info*.
   ⇨ The device information will be displayed.

3. Press the Back button (23) to leave the device information.

Advanced settings

1. Press the *Parameter* button (19).
   ⇨ The parameter menu bar will be displayed.

2. Press the desired button to access the corresponding menu:
   ⇨ No. (30) calls up the *Parameter* menu.
   ⇨ No. (31) calls up the *Colour settings* menu.
   ⇨ No. (32) calls up the *Photo settings* menu.
3. Press the Back button (23) to close the menu bar.

Parameter **menu**

In this menu you can adjust general parameters such as the ambient temperature or the emissivity.

1. Touch the parameter you want to edit.
   ⇨ A submenu with setting options for the selected parameter will be displayed. Displayed in our example is the submenu for the ambient temperature.

   ⇨ The following parameters can be selected:
   Ambi. Temperature = Setting the ambient temperature
   Humidity = Setting the humidity level
   Emissivity = Setting the emissivity
   Distance = Setting the distance to the measuring object
   Refl. Temperature = Setting the average value of the reflected temperatures from heat sources located in the background, which could influence the object to be thermographed.
   Unit Settings = Setting the units used (metric, imperial)
   Temperature Level = Setting the measuring range
2. Select the desired value for the parameter.
3. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.
4. Press the Back button (23) to leave the menu or briefly touch a free area on the touch screen.

Colour settings submenu

In this submenu you can select the colour palette for the representation of the temperatures in the thermal image.

1. Press the button with the desired setting. The colour palette will be applied immediately and is visible in the background.
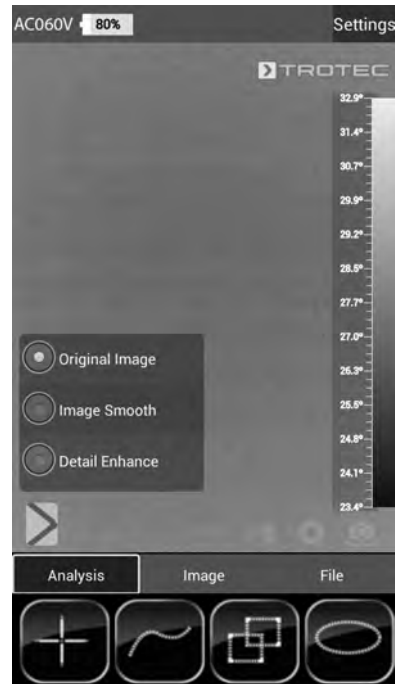

2. Press the Back button (23) to leave the submenu or briefly touch a free area on the touch screen.
    ⇨ The settings will be saved.

Photo settings submenu

In this submenu you can adjust the thermal image display.

1. Press the button with the desired setting. Selected in this example is the setting *Original Image*.


⇨ The following parameters can be selected:
   Original Image = Image is depicted normally.
   Image Smooth = Image is blurred.
   Detail Enhance = Image is depicted with a higher resolution.

2. Press the Back button (23) to leave the submenu or briefly touch a free area on the touch screen.
    ⇨ The settings will be saved.

Analysis mode

In the analysis mode points, lines or areas can be marked on the display to be analysed in real time.

1. Enable analysis mode by pressing the *Analysis* button in the Mode menu bar (17).
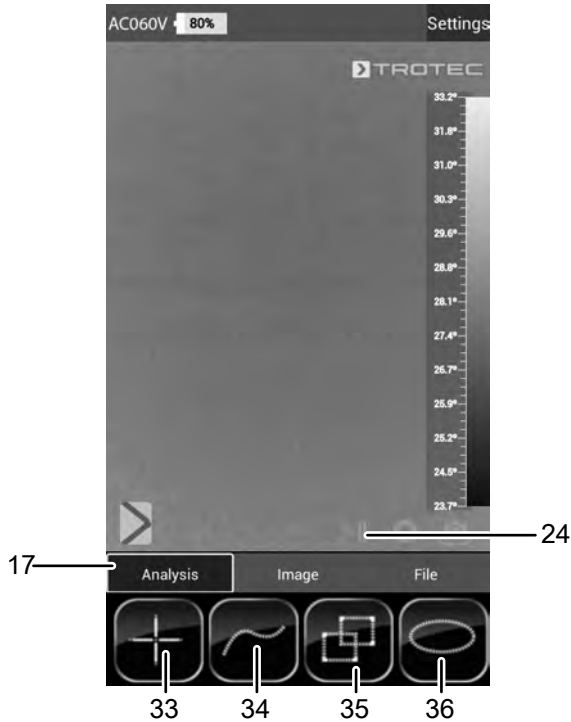
2. You can press the Still image button (24) to freeze an image for analysis.

Point analysis

1. Press the button for points (33).
   ⇨ Crosshairs appear on the display beside which the current temperature of the point is indicated.
2. Touch the specific display location to select the point to be analysed.
   ⇨ The button for points (33) will be enabled.
   ⇨ The button is now displayed as crosshairs with a recycle bin (37).
   ⇨ In order to delete the point, drag it to the corresponding button with the recycle bin (37).
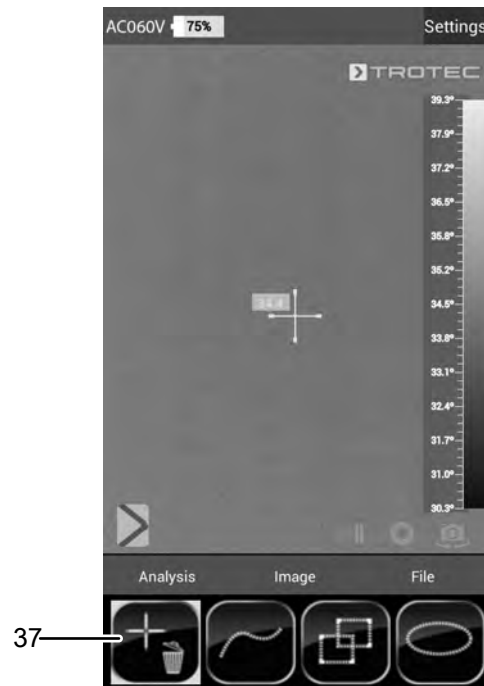
3. Touch a selected measuring spot for approx. one second; then a submenu opens in which the selected measuring spot can be individually configured as follows:
   ⇨ Alarm: visual and acoustic alarm signal when falling below (Below), exceeding (Above) or hitting (Equal) a set alarm temperature precisely.
   ⇨ Max: locates the hottest point in the image section
   ⇨ Min: locates the coldest point in the image section
4. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.

Area analysis

On the screen you can draw up to two rectangular or circular areas respectively to carry out a separate area analysis within the thermogram.

1. Press the button for rectangles (35) or circles (36).
2. Touch the starting point on the display and then stretch the rectangle or circle to be analysed.
   - ⇨ The rectangle or circle appears on the screen. Displayed in the top left corner of the screen is a panel indicating the maximum, minimum and average measured values within the area (*R* stands for rectangle, *C* for circle).
   - ⇨ To adjust the size or direction of the respective area, touch one of the corners or the line and drag it to the desired shape/size.
   - ⇨ To relocate an area in its entirety on the screen, touch its centre and drag it to the desired position.
   - ⇨ The button for rectangles or circles will be enabled.
   - ⇨ The button is now displayed with a recycle bin (example: rectangle (38)).
   - ⇨ In order to delete the point, drag it to the corresponding button with the recycle bin.

38

3. Touch the centre of a selected rectangular or circular area for approx. one second; then a submenu opens in which the maximum, minimum or average value can be (de-)activated.
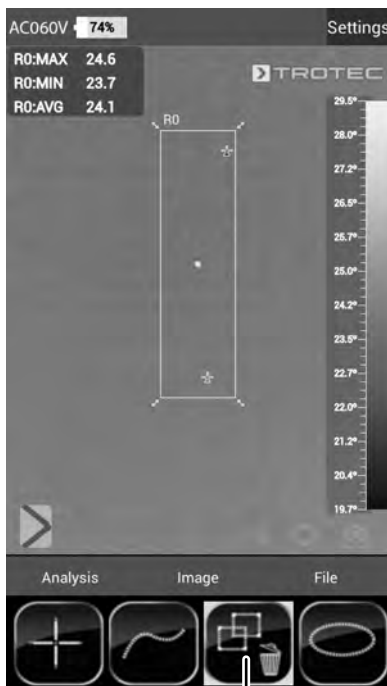
4. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.

Line analysis

1. Press the button for lines (34).
   - ⇨ The line appears on the display. Above and below the line the temperature profile is displayed in form of a chart in the below thermogram area.
   - ⇨ To relocate the line analysis, touch the analysis field and drag it to the desired thermogram area.
   - ⇨ The button for lines (34) will be enabled.
   - ⇨ The button is now displayed with a recycle bin (39).
   - ⇨ In order to delete the line, drag it to the corresponding button with the recycle bin.

Image mode

Via the image mode you can take pictures or record videos and make further settings regarding the images generated by the IR camera.

1. Enable image mode by pressing the *Image* button in the Mode menu bar (17).
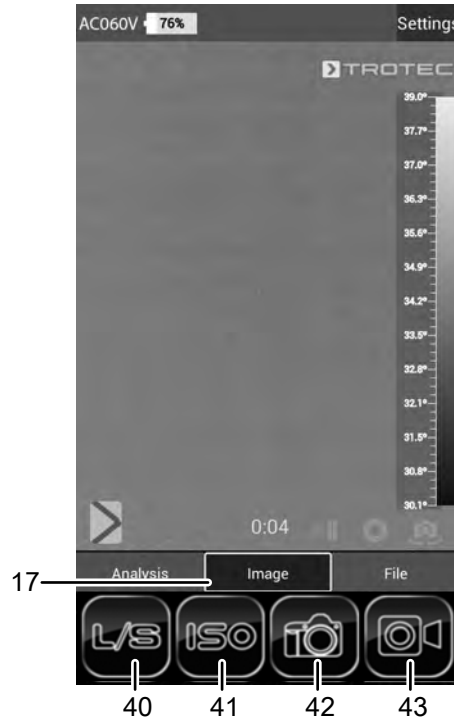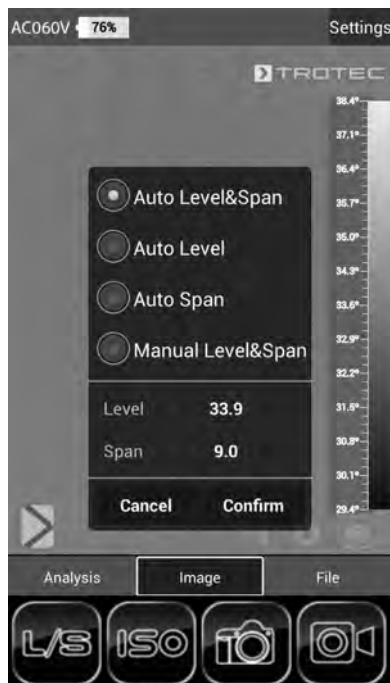
Taking a picture

1. Press the *Camera* button (42).
   - ⇨ The picture is taken and saved.

Recording a video

1. Press the *Video* button (43).
   - ⇨ The recording starts.
   - ⇨ The duration of the recording is displayed above the Mode menu bar.
2. Press the Video button (43) again (now displayed as pause symbol) to stop recording.
   - ⇨ The video will be saved.

Setting brightness and contrast

1. Press the L/S button (40).
    ⇨ The brightness and contrast menu (*LEVEL & SPAN*) will be displayed.
       Contrast (*SPAN*):
       set temperature range (e.g. from 5 °C to 30 °C
       => SPAN = 25 °C)
       Brightness (*LEVEL*):
       average temperature referring to the set temperature range (in accordance with the above example = 17.5 °C)
       By reducing and shifting the span even the slightest of temperature differences can be visualized in practice, for instance for the localization of subsurface hot water pipes, specific structural-physical problems or industrial applications.

2. Select the desired settings for brightness and contrast and enter the values by hand, if required. In addition to the manual input of direct numerical values, both brightness (*LEVEL*) and contrast (*SPAN*) can also be adjusted fluently by swiping the screen.
    ⇨ Contrast (*SPAN*):
       – Swiping down reduces the span and increases the contrast.
       – Swiping up increases the span and reduces the contrast.
    ⇨ Brightness (*LEVEL*):
       – Swiping right increases the average temperature. The image turns darker.
       – Swiping left decreases the average temperature. The image turns brighter.

3. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.

⇨ The following parameters can be selected:
Auto Level&Span = Brightness and contrast are automatically adjusted.
Auto Level = The brightness is automatically adjusted. The contrast can be entered manually.
Auto Span = The brightness is automatically adjusted. The brightness can be entered manually.
Manual Level&Span = Brightness and contrast are adjusted manually.

Setting ISO mode

Isotherms are colours of the same temperature. In this mode the thermal imaging camera highlights all areas within a certain previously specified temperature range (isotherm window) by means of a selected, particularly noticeable colour. This can e.g. be drops below dew point at building surfaces or thermally critical areas in control cabinets etc.

1. Press the *ISO* button (41).
    ⇨ The ISO mode menu will be displayed.

⇨ The following parameters can be selected:
Between = The isotherm window is situated in between the minimum and the maximum temperature of the currently displayed temperature scale of the camera. It can be varied freely by dragging the upper and lower limits (arrow).
Above = The isotherm window starts at the upper end of the temperature scale and can only be varied by dragging the lower limit.
Below = The isotherm window starts at the bottom end of the temperature scale and can only be varied by dragging the upper limit.
ISO Color Picker = Select an isotherm colour from the ring. Touch the centre of the ring to confirm your selection.

2. Select the desired settings.
3. Press *Confirm* to confirm and save the selection. If you do not want to save the change, press *Cancel*.

Example *ISO Mode: Between*

Example *ISO Mode: Below*
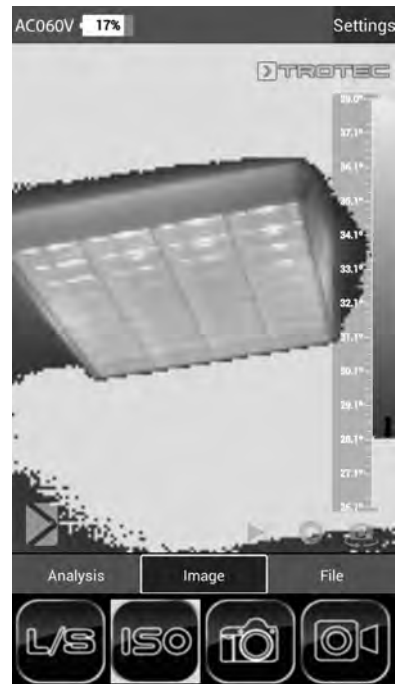
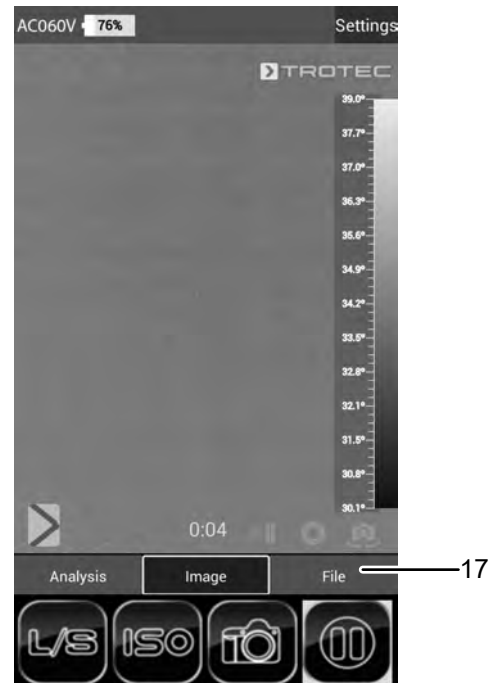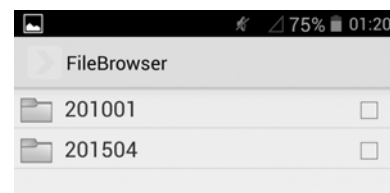**Example *ISO Mode: Above***
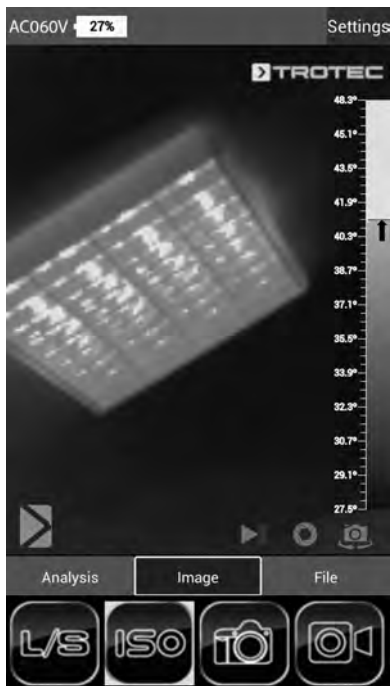
File mode

In file mode you can view already taken/recorded pictures or videos.

1. Enable file mode by pressing the *File* button in the Mode menu bar (17).

⇨ The file browser opens.

2. Select a folder.
    ⇨ The images and/or videos in the folder are displayed in a list.
3. Select a file.
    ⇨ The file will be displayed on the screen.

Emissivity

The emissivity is used to describe the energy radiation characteristic of a material (see also chapter Thermography terms).

A material's emissivity depends on various factors:

- composition,
- surface condition,
- temperature.

The emissivity can range between 0.01 and 1 (in theory). The following rule of thumb can be assumed:

- When a material is rather dark and its surface texture matt, it probably has a high emissivity.
- The brighter and smoother the surface of a material, the lower will be its emissivity, presumably.
- The higher the emissivity of the surface to be measured, the better it is suited for non-contact temperature measurement by use of a pyrometer or thermal imaging camera, since falsifying temperature reflections can be neglected.

Entering an emissivity as accurate as possible is indispensable for a precise measurement.

Most organic materials have an emissivity of 0.95. Metals or shiny materials come with a much lower value.

Material	Temperature (°C)	Emissivity (approximate)
Aluminium		
Polished aluminium	100	0.09
Customary aluminium foil	100	0.09
Electrolytically chromium-plated aluminium oxide	25 – 600	0.55
Mild aluminium oxide	25 – 600	0.10 – 0.20
Strong aluminium oxide	25 – 600	0.30 – 0.40

Material	Temperature (°C)	Emissivity (approximate)
Iron		
Polished cast iron	200	0.21
Processed cast iron	20	0.44
Polished tempered iron	40 – 250	0.28
Polished steel ingot	770 – 1040	0.52 – 0.56
Raw, welded steel	945 – 1100	0.52 – 0.61
Surface iron oxide	20	0.69
Fully rusted surface	22	0.66
Rolled iron plate	100	0.74
Oxidized steel	198 – 600	0.64 – 0.78
Cast iron (oxidizing at 600 °C)	198 – 600	0.79
Steel (oxidizing at 600 °C)	125 – 520	0.78 – 0.82
Electrolytic iron oxide	500 – 1200	0.85 – 0.95
Iron plate	925 – 1120	0.87 – 0.95
Cast iron, heavy iron oxide	25	0.80
Tempered iron, iron oxide	40 – 250	0.95
Melting surface	22	0.94
Molten cast iron	1300 – 1400	0.29
Molten structural steel	1600 – 1800	0.28
Liquid steel	1500 – 1650	0.28
Pure iron ore	1515 – 1680	0.42 – 0.45
Galvanized, shiny iron plate	28	0.23
Copper		
Copper oxide	800 – 1100	0.13 – 0.16
Copper mirror	100	0.05
Strong copper oxide	25	0.078
Liquid copper	1080 – 1280	0.13 – 0.16

thermal imaging camera AC060V

Material	Temperature (°C)	Emissivity (approximate)
Brass		
Brass mirror	28	0.03
Brass oxide	200 – 600	0.59 – 0.61
Chromium		
Polished chrome	40 – 1090	0.08 – 0.36
Gold		
Gold mirror	230 – 630	0.02
Silver		
Polished silver	100	0.05
Nickel		
Nickel chromium (heat-resistant)	50 – 1000	0.65 – 0.79
Nickel chromium alloy	50 – 1040	0.64 – 0.76
Nickel chromium alloyed (heat-resistant)	50 – 500	0.95 – 0.98
Nickel silver alloy	100	0.14
Polished, galvanized	25	0.05
Galvanized	20	0.01
Nickel wire	185 – 1010	0.09 – 0.19
Lead		
Pure lead (not oxidized)	125 – 225	0.06 – 0.08
Stainless steel		
18 -8	25	0.16
304 (8Cr, 18Ni)	215 – 490	0.44 – 0.36
310 (25Cr, 208Ni)	215 – 520	0.90 – 0.97
Tin		
Finished tin plate	100	0.07
Heavily oxidized	0 – 200	0.60
Zinc		
Oxidizing at 400 °C	400	0.01
Zinc oxide ash	25	0.28
Magnesium		
Magnesia	275 – 825	0.20 – 0.55
Metallic materials		
Hg	0 – 100	0.09 – 0.12
Sheet metal		0.88 – 0.90

Material	Temperature (°C)	Emissivity (approximate)
Non-metallic materials		
Brick	1100	0.75
Fire brick	1100	0.75
Graphite (lamp black)	96 – 225	0.95
Porcelain enamel (white)	18	0.90
Asphaltum	0 – 200	0.85
Glass (surface)	23	0.94
Lime paint	20	0.90
Oak	20	0.90
Piece of coal		0.85
Isolation piece		0.91 – 0.94
Glass tube		0.90
Porcelain enamel products		0.90
Porcelain enamel designs		0.83 – 0.93
Solid materials		0.80 – 0.93
Ceramic (vase)		0.90
Film		0.90 – 0.93
Heat-resistant glass	200 – 540	0.85 – 0.95
Mica		0.94 – 0.95
Glass		0.91 – 0.92
Level chalk layer		0.88 – 0.93
Epoxy glass plate		0.86
Epoxy hydroxybenzene plate		0.80
Electric materials		
Semiconductor		0.80 – 0.90
Transistor (plastic sealed)		0.30 – 0.40
Transistor (metal diode)		0.89 – 0.90
Gold-plated copper sheet		0.30
Soldered plated copper		0.35
Zinc-plated lead wire		0.28
Brass wire		0.87 – 0.88

Errors and faults

The device has been checked for proper functioning several times during production. If malfunctions occur nonetheless, check the device according to the following list.

Fault	Cause	Remedy
Abortion of the AC060V app.	The software has crashed.	Start the software again.
Camera does not take/record pictures/videos.	Internal memory full.	Delete files no longer needed to free up storage space.
Battery quickly discharged.	Battery too old or damaged.	Use a new battery.
Battery not charging.	Charging cable not inserted correctly.	Check the connection for proper fit.
	Battery too old or damaged.	Use a new battery.
	Contacts dirty.	Use a dry, clean cloth to clean the contacts.

Maintenance and repair
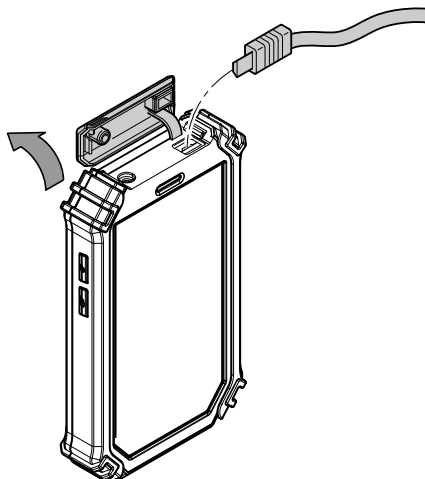
Charging the battery

⚠ **Warning of electrical voltage**
Before each use of the charger or power cable, check for damages. If you notice damages, stop using the charger or power cable!

Charge the battery when the charging status indicator (20) falls below 10 %, when the device prompts you to or can no longer be switched on. Ideally the battery is always charged by use of the charger included in the scope of delivery. Only use the supplied charger to do so! If the camera needs to be used while charging, please proceed as follows:

1. Plug the charger into a sufficiently fused power socket. Only use the original charger or one with identical specifications, for otherwise both battery and camera could be damaged!
2. Open the protective cover for the micro USB connection (1) at the device.
3. Connect the charger to the micro USB connection.

4. Disconnect the charging cable again, once the charging status indicates 100 %.

Changing the battery

To change the battery, please proceed as described under *Inserting the battery*. Remove the old battery before inserting a new one.

Cleaning

Clean the device with a soft, damp and lint-free cloth. Make sure that no moisture enters the housing. Do not use any sprays, solvents, alcohol-based cleaning agents or abrasive cleaners, but only clean water to moisten the cloth.

Repair

Do not modify the device or install any spare parts. For repairs or device testing, contact the manufacturer.

Disposal

🗑 The icon with the crossed-out waste bin on waste electrical or electronic equipment stipulates that this equipment must not be disposed of with the household waste at the end of its life. You will find collection points for free return of waste electrical and electronic equipment in your vicinity. The addresses can be obtained from your municipality or local administration. For further return options provided by us please refer to our website www.trotec24.com.

The separate collection of waste electrical and electronic equipment aims to enable the re-use, recycling and other forms of recovery of waste equipment as well as to prevent negative effects for the environment and human health caused by the disposal of hazardous substances potentially contained in the equipment.

🗑 Li-Ion

In the European Union, batteries and accumulators must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators. Please dispose of batteries and accumulators according to the relevant legal requirements.