USER MANUAL

THERMAL IMAGERS
KT-80 ● KT-145

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THERMAL IMAGER
KT-80 and KT-145

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Thank you for purchasing our thermal imager. KT series thermal imager is a modern, easy and safe to use measuring device. Please acquaint yourself with the present manual in order to avoid measuring errors and prevent possible problems related to operation of the imager.

All products of Sonel S.A. are manufactured in accordance with Quality Management System which is approved to ISO9001:2008 for the design, manufacturing and servicing.

Due the continuous development of our products, we reserve the right to introduce changes and improvements in the thermal imaging camera and in the software described in this manual without prior notice.

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1 Safety

Before you proceed to operate the camera, acquaint yourself thoroughly with the present manual and observe the safety regulations and specifications defined by the manufacturer.

- Any application that differs from those specified in the present manual may result in a damage to the device and constitute a source of danger for the user.
- The camera must not be used in rooms where special conditions are present e.g. fire and explosion risk.
- It is forbidden to use damaged or malfunctioning camera and is partially or fully out of order.
- In case the camera is not used for a long time, its batteries should be removed.
- It is not allowed to use the camera with half-closed or opened battery cover and do not use any other power adapter than the one supplied with the camera.
- Repairs may be carried out only by an authorised service point.

KT-145 (KT-80) Thermal Imager is designed to measure and record the images in the infrared. The camera is constructed in a manner which gives you maximum performance and safe-ty at work, however the following precautions must be adhered to at all times (in addition to any advised precautions applicable at the relevant work-site or work area):

- Keep the camera steady during operation.
- Do not use the camera in ambient temperatures exceeding its operation and storage temperature ranges.
- **Do not direct the camera toward very high intensity radiation sources such as the sun, lasers or welding arcs etc.**
- Do not expose the camera to dust and moisture. When operating the device near water, ensure that it is adequately guarded against splashes,
- When the camera is not in use or is to be transported, ensure that the unit and its accessories are stored in the protective carry case.
- Do not re-switch on the imager before 15 seconds after switching it off.
- Do not throw, knock or shake intensely the camera and its components in order to avoid the damage.
- Do not attempt to open the imager's body, as this action will void the warranty.
- Keep the SD memory card for the exclusive use of the camera.
- During operation, if the camera is to be moved from hot/cold place to cold/hot place, e.g. from inside/outside to outside/inside of a room, switch the imager off and leave it in the new workplace for 20 minutes, then turn it on and start normal operation with an accurate temperature measurement. Sudden and rapid changes in ambient temperature may cause fault temperature measurement and even damage camera's IR detector.

- Detector calibration - autocalibration, of 2 seconds duration, performs automaticly during operation of the device, and is dependent on external conditions and i salso indicated by „calibration" word displayed on screen.

NOTE!
Use only standard and additional accessories,
listed in "Equipment" section. Using other accessories does not ensure
proper operation of the camera and may cause its damage.

NOTE!
Due to the continuous development of the device, the design
of the display and its certain features may be slightly different than presented
in this manual.

NOTE!
KT-145 (KT-80) Thermal imager has no parts that could
be repaired by its user. Never attempt to dismantle or modify the device.
Opening up the unit invalidates the warranty.

NOTE!
To maintain required parameters of rechargeable batteries, unused rechargeable batteries should be charged every 3 months. If the device is not used for a longer period of time, the batteries must be removed from it and stored separately.

2 Description of the camera

2.1 *Description of camera body features*
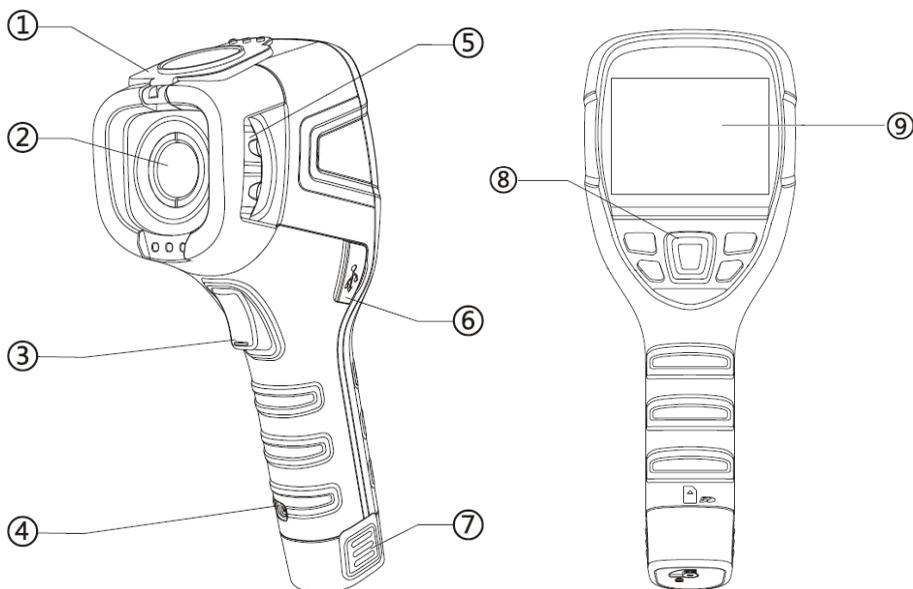
1. Lens cover (built-in magnet)
2. Lens
3. Trigger buton
4. Strap holder
5. Focus ring
6. micro-USB port
7. Li-Ion battery (after removing the battery – SD card slot)
8. Function button
9. LCD Display

3 Function buttons and on-screen menu

3.1 Buttons layout

Access to the camera's functions is provided through the buttons located below the LCD screen as well as a trigger button (3).

Funtion buttons are arranged as shown below:
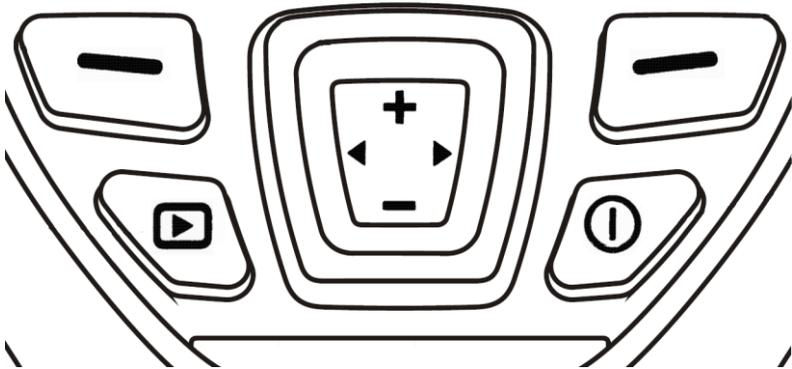
Left function button,

right function button,

SD card browser button,

turning the camera and display on/off,

multifunction cursor:

zoom in (only in KT-145), increasing selected numbers, move up,

zoom out (only in KT-145), decreasing selected numbers, move down,

move left,

move right.

3.2 Display

During operation of the camera, the infrared image is shown on the screen (9) in real time. The value of temperature at the central point of the screen is always displayed in the upper left corner of the screen.

After activating any function or performing a measurement, in the right side of the screen a temperature range bar appears, color-coded for the corresponding temperatures on screen. In the bottom part of the screen a menu appears, where each of the available functions is executed with one of the two corresponding buttons.:

In the above example, the left button, ⬡, is linked to „Menu", and the right buton, ⬡, is linked to „Auto".

3.3 Arrangement of information on the screen

KT-145 screen:

Central point temperature

battery indicator

Clock

cursor/central point

Temp. range

Palette

set emissivity indicator

go to camera's menu

Temp. range mode selection

KT-80 screen:

Central point temperature

battery indicator

Clock

set emissivity indicator

Temp. range

cursor/central point

Palette

go to camera's menu
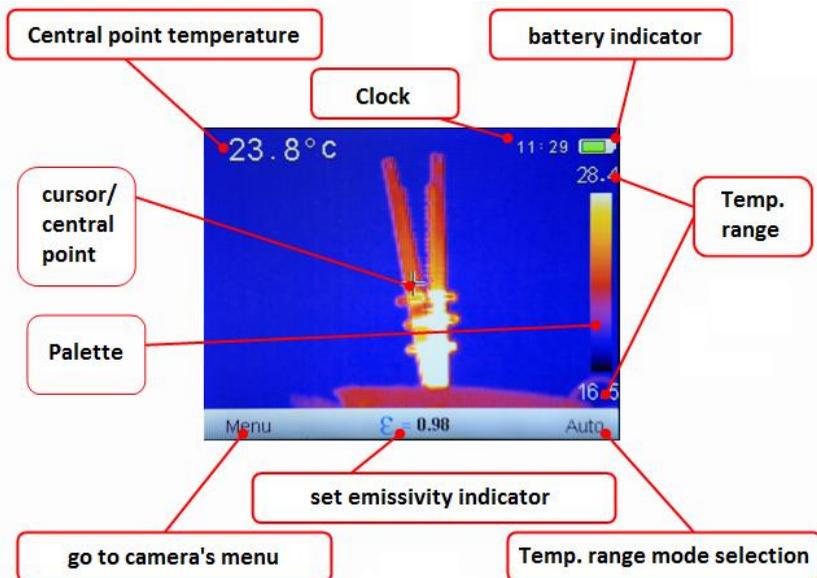
Temp. range mode selection
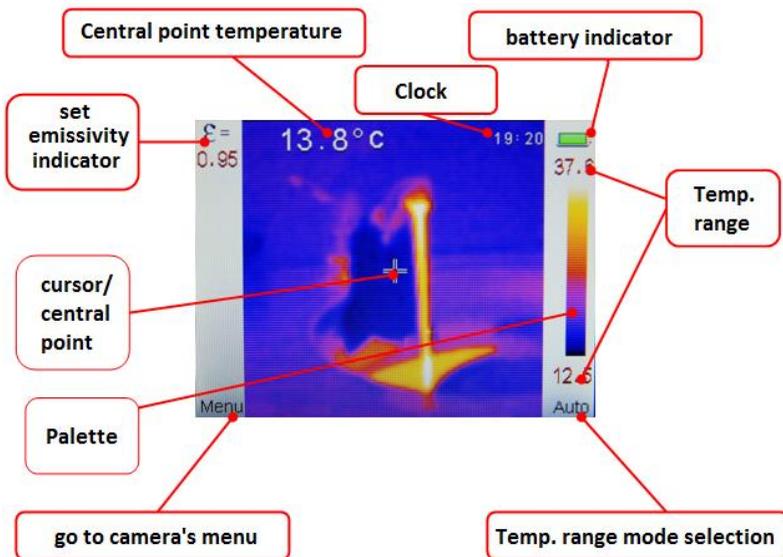
4 Operation Instructions And The Camera Adjustment

Handling of KT-80 and KT-145 is similar, so this manual describes operational principles of the imagers based on KT-145 model, due to its superior features. The differencess between the two models are clearly marked in this manual. Operating of KT-80 is the same as the one described below (Features unavailable in KT-80 are marked as well).

4.1 Turning the camera and the display on/off

Before turning on the camera flip the lens cover open:
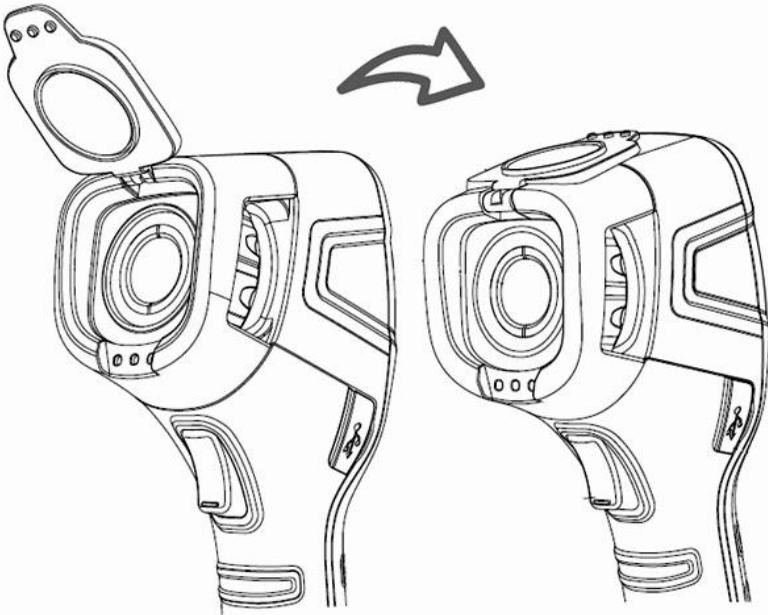
To switch on the camera, press and hold $\boxed{\textcircled{0}}$ buton for longer than 3 seconds.

A welcome logo will be displayed, followed by the self-test results of the instrument. When the procedure is completed, the camera is ready to be used, and real time infrared image display mode is on.

To switch off the camera, press and hold $\boxed{\textcircled{0}}$ button, and Power Off progress bar will appear on the screen (POWER OFF).
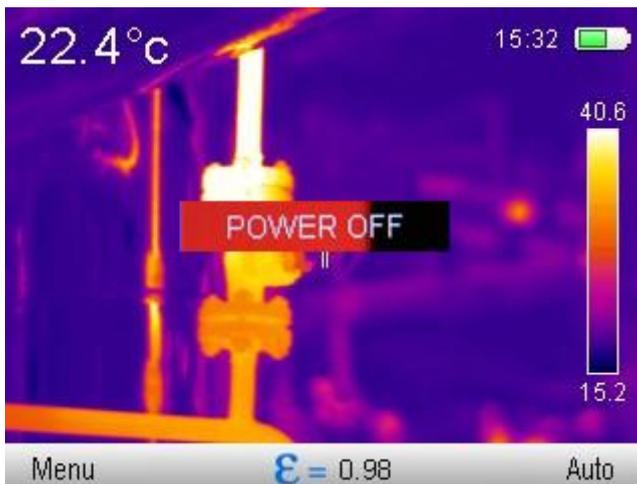
The buton must be hold until the screen turns off (switching off doesn't work in Full Screen mode).

Brief press of ⟨⓪⟩ buton switches on/off the screen. To save battery, it is advised to use this feature when times between each measurement are short. When the camera is not used for longer period is advised to switch it off completely.

NOTE!
In order to eliminate potential errors in temperature measurement af-ter switching off the camera, it is advised to wait 15 seconds before switching the camera on again.

4.2   Focus adjusment

After directing the camera towards the examined object, turn the focus adjustment ring (5) to set the best focus of image.

4.3   Enlarging the image – Zoom (x2) (only in KT-145)

Multifunction cursor ⟨±⟩ is used for zoom adjustment. When no menu (Full screen mode - described in other part of this manual) is displayed on the screen, pressing the button ✚ will cause switching to the zoom mode - the image on the screen will be digitally mag-nified two times. In this mode sharpness can be precisely adjusted, but no other features

are available at this point. Entering zoom mode is indicated by magnifier symbol in the bottom, middle part of the screen. Pressing ▬ buton restores normal image mode.

4.4 Temperature range

The camera offers both manual and auto mode for temperature range selection.

The indication of the temperature range mode that is currently on, is shown in the bottom, right part of the screen. press ⬭ buton to select:

- automatic adjustment of displayed temperature range - the minimal and maximal temperatures will be automatically adjusted by the instrument while the measurement is performed, depending on the range of temperatures detected in the observed area.,

- manual adjustment of temperature range. Select this mode to activate a menu where setting of the upper limit of the temperature (Tmax) can be done.:

Press ➕ or ➖ buttons to increase/decrease the displayed upper limit of the temperature range (the changed value is additionally marked by a red frame) (**only KT-145**).

Pressing the button ▶ causes switching over to setting the lower limit of the temperature range, Tmin, which can, just like the upper limit, be adjusted with the buttons ✚ or ━:

Pressing the button ◀ effects in switching over to setting the upper limit of the temperature range. The manually selected temperature range is confirmed by pressing ⟨ ━ ⟩ button. Current temperature range setting can be cancelled by pressing ⟮ ━ ⟯ „Exit" button.

4.5 Capturing and saving images

The camera displays image in continuous manner. In order to capture the image at a given moment, press the trigger button (3) to freeze the image and display the menu on the screen:
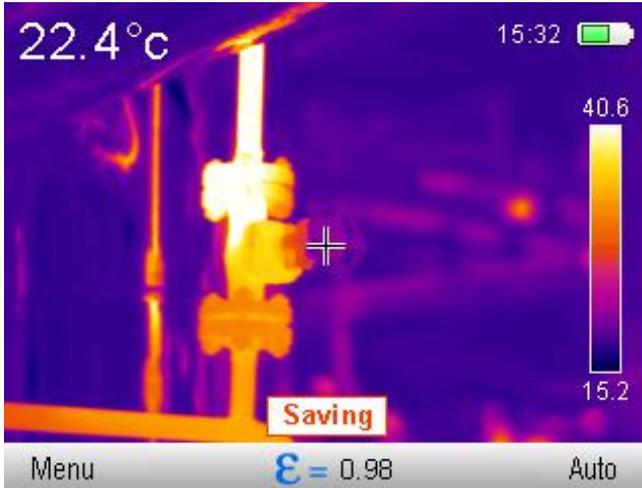
followed by the file name, under which the screen has been saved and stored:
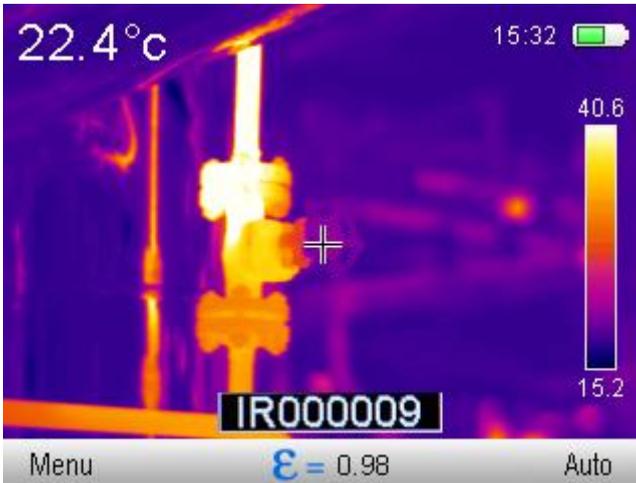
After the image has been saved, the camera automatically goes back into real time infrared mode.

4.6 Menu, settings, features

When no menu is displayed on the screen, press ⬱ buton or ⬱ buton to bring bottom menu bar into screen:

Select „Menu" (by pressing ⬱ button) to open up the main menu, that allows to change settings of the camera:
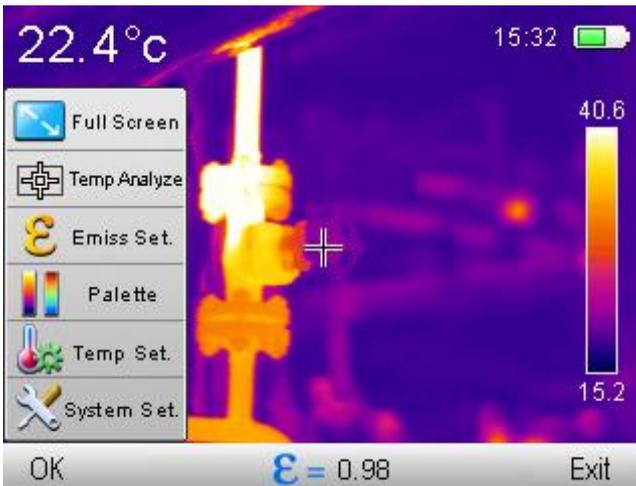
Parameters can be selected with the use of 'up' and 'down' cursors (➕ or ➖ buttons).
Select chosen parameter and confirm the selection by pressing 'OK' buton (⬱) or

'right' buton (right). Press 'Exit' buton (exit) or 'left' buton to exit (left).

4.6.1 Full screen

The main mode is displayed on the screen.
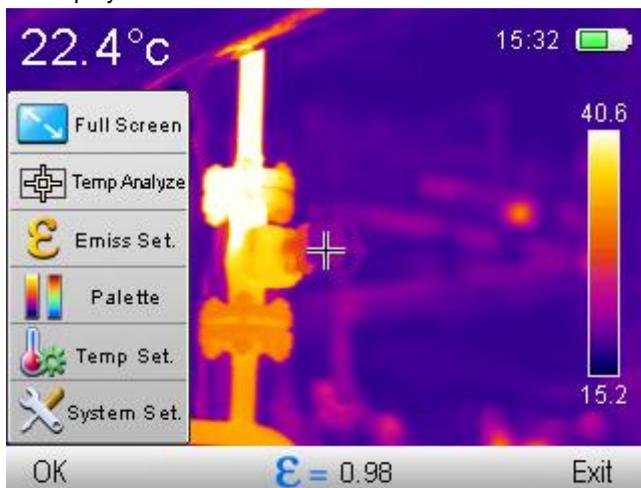
Select Full Screen mode and press OK to confirm, to switch the camera into full screen mode:
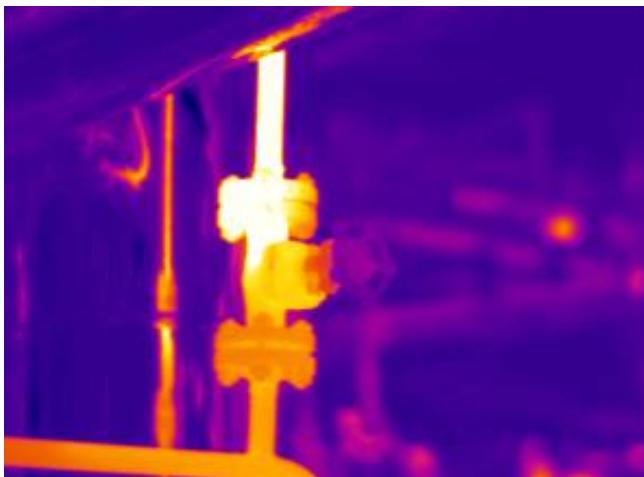
Restore normal mode by pressing buttons button or button .

4.6.2 Temperature Analysis

The main mode is displayed on the screen.
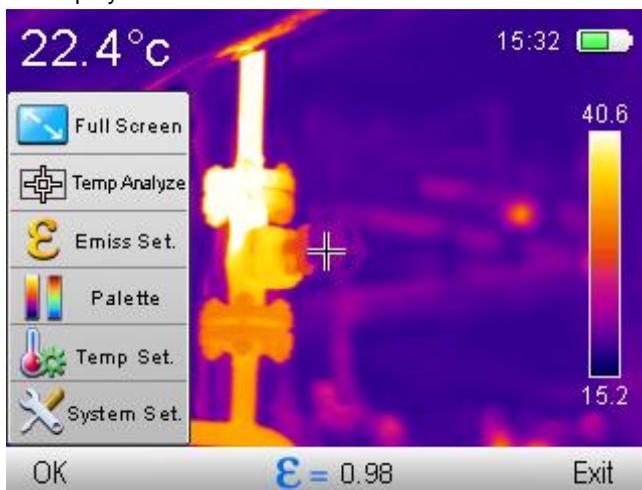
Select 'Temp Analyze' to unfold drop down sub menu with analysis tools:
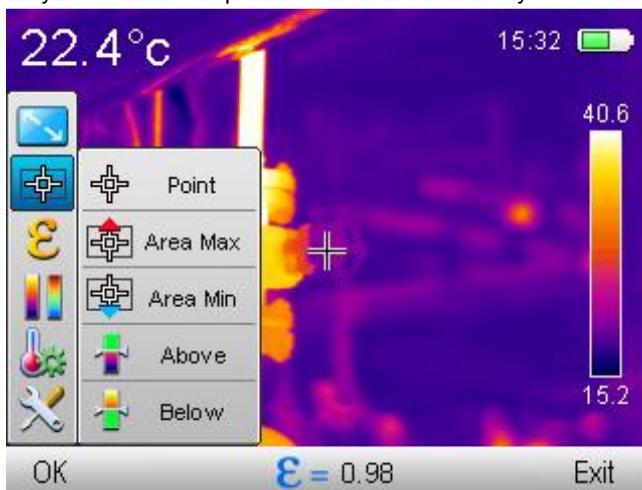
Several options are available in this mode.

4.6.2.1 Point

Select 'Point' to activate the camera in normal mode, with point cursor in the center of the screen:

4.6.2.2 Area Max

Select 'Area Max' to activate the mode that allows to monitor the temperature in a way that shows the point of maximum temperature within selected area:
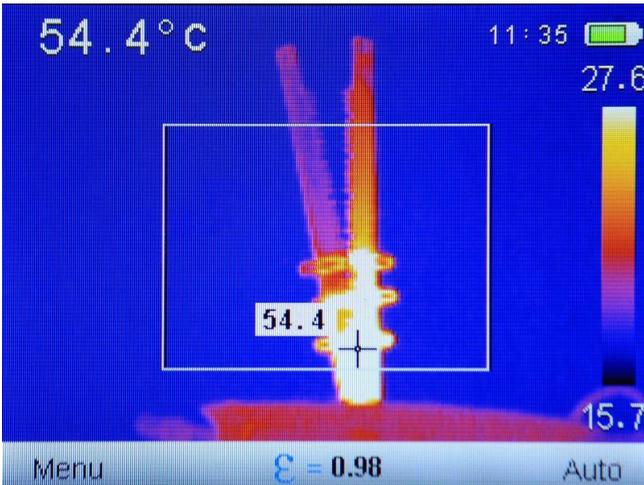
Area that is being monitored for the highest temperature is created. Cursor inside the area is changing its position whenever new point of the highest temperature is detected. Additionaly, only in **KT-145:** Cursor temperature indication in repeated on screen by the cursor

itself, and when the Max Temperature alarm mode is on, the max temperature indicator by the cursor will be changing its color whenever the threshold temperature level is crossed (the background color of the temperature indicator will change its color repeatedly: yellow to black to yellow. The color of the digits showing temperature value will be alternating in the same manner).

4.6.2.3 Area Min.

Select 'Area Min' to activate the mode that allows to monitor the temperature in a way that shows the point of minimum temperature within selected area:

Area that is being monitored for the lowest temperature is created. Cursor inside the area is changing its position whenever new point of the lowest temperature is detected. Additionaly, only in **KT-145:** Cursor temperature indication in repeated by the cursor itself, and when the MinTemperature alarm mode is on, the mintemperature indicator by the cursor will be changing its color whenever the threshold temperature level is crossed (the background color of the temperature indicator will change its color repeatedly: blue to black to blue. The color of the digits showing temperature value will be alternating in the same manner).

4.6.2.4 Above (Isotherm analysis)

Selecting 'Above' starts isotherm analysis mode, effecting in the areas, of the temperatures higher than the preset reference temperature (threshold), being displayed in red colour:
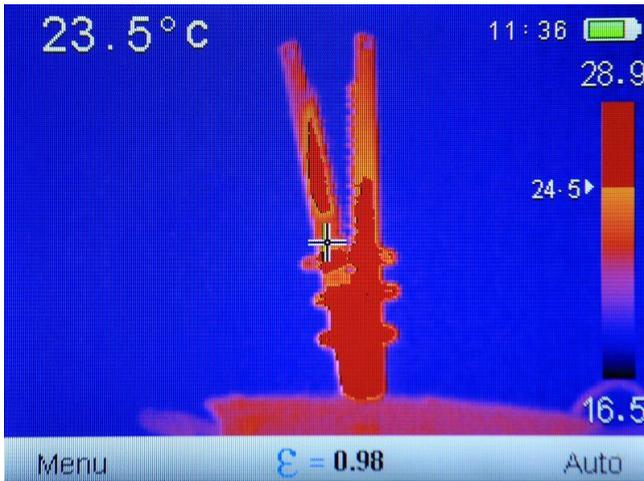
Isotherm threshold temperature in displayed next to the palette indicator , and it can be increased and decreased by pressing ✚ or ━ buttons.

Press „MENU" ⟨━⟩ or „Auto" ⟨━⟩ to exit this mode. In isotherm analysis mode image saving is unavailable.

4.6.2.5 Below (Isotherm analysis)

Selecting 'Below' starts isotherm analysis mode, effecting in the areas, of the temperatures lower than the preset reference temperature (threshold), being displayed in blue colour:
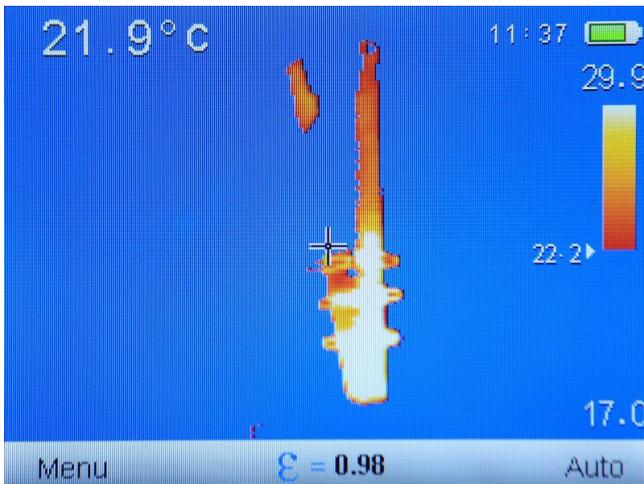
Isotherm threshold temperature in displayed next to the palette indicator , and it

can be increased and decreased by pressing ➕ or ➖ buttons.

Press „MENU"⬛ or „Auto" ⬛ to exit this mode. In isotherm analysis mode image saving is unavailable.

4.6.3   Emissivity

The main mode is displayed on the screen,
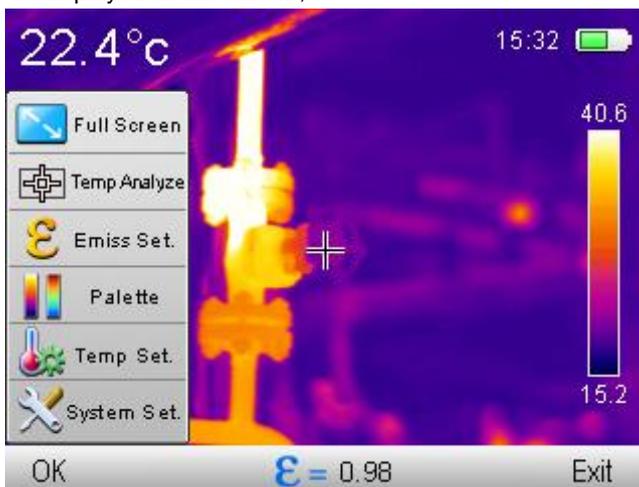
select 'Emiss Set.' To pop up the window with emissivity coefficient value selection, with a list of the most common materials along with their emissivity coefficient values, also known as reference emissivity values:

Move up and down and across the list with 'up/down' buttons (➕ or ➖) and 'left/right' buttons (◀ or ▶), select the material of your interest and confirm your selection with

„OK" ⌐━⌐ buton. Doing so will bring back the temperature measurement mode onto the screen.

Emissivity can also be set manually by selecting 'Custom' on the list and confirming the selection by pressing 'OK' ⌐━⌐ . The table screen will be closed, and the possibility of changing the emissivity value on screen, in measurement mode, will be added ⊞ε = 0.98 press 'up/down' buttons to set the proper value (✚ or ━).

Confirm the selection by pressing 'OK' buton (⌐━⌐), or cancel it by pressing 'Exit' button (⌐━⌐).

4.6.4   Palette

The main mode is displayed on the screen,
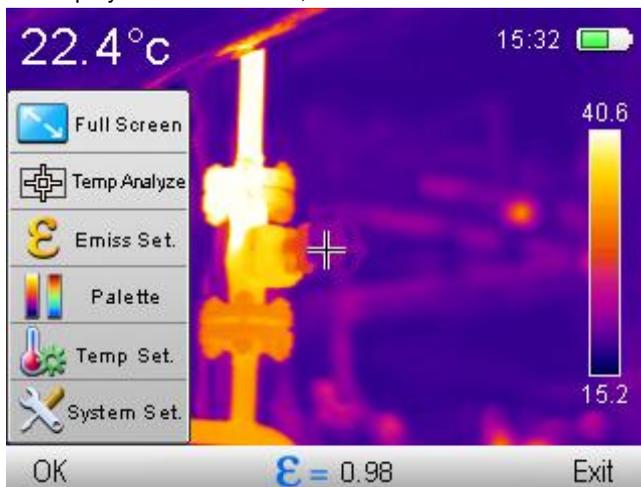
Select 'Palette' to pop up the window that allows to select one of the available palettes.
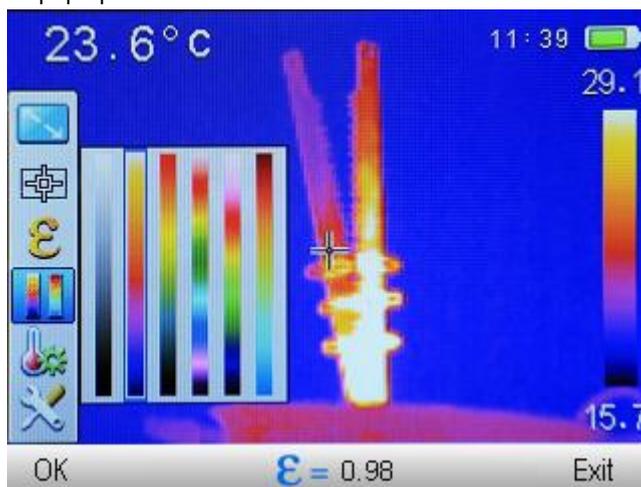
Selection is done by 'left/right' buttons (◀ or ▶), confirmation is done by pressing 'OK'

buton (⬚), and cancelation is done by pressing 'Exit' button (⬚).

There are four palettes available in T-80, while KT-145 provides six different palettes:
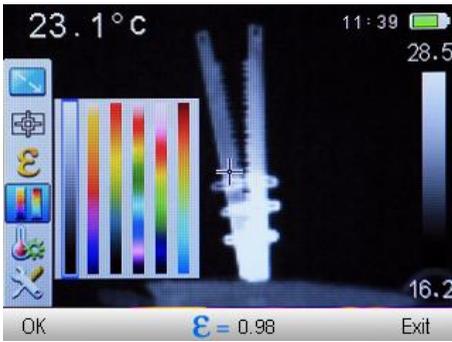
(KT-80 and KT-145)
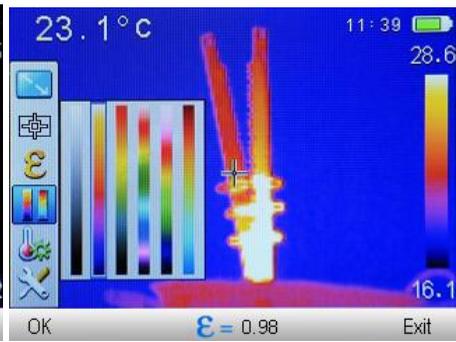
(KT-80 and KT-145)
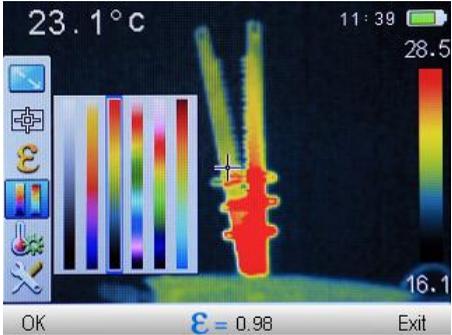
(KT-80 and KT-145)

(KT-80 and KT-145)
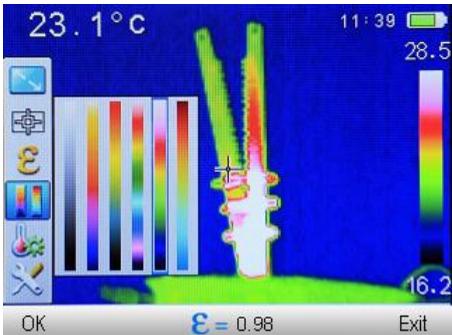
(only KT-145)
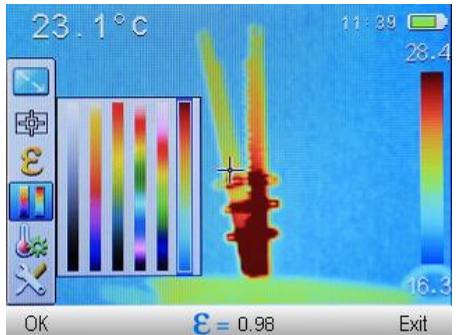
(only KT-145)

4.6.5 Temperature settings (temperature measurement settings)

The main mode is displayed on the screen,
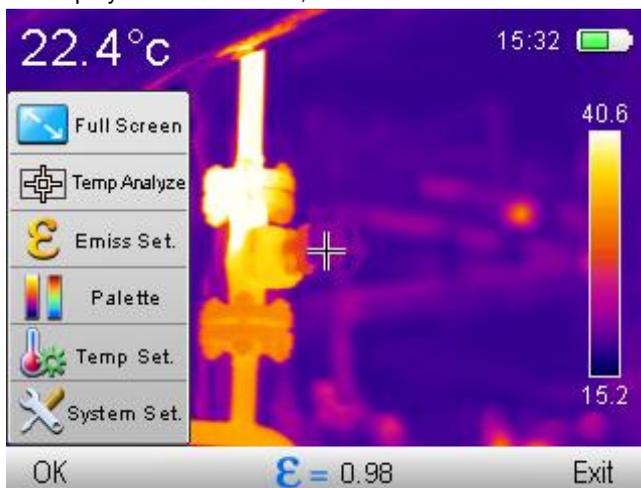
Select 'Temp Set.' To open up submenu.
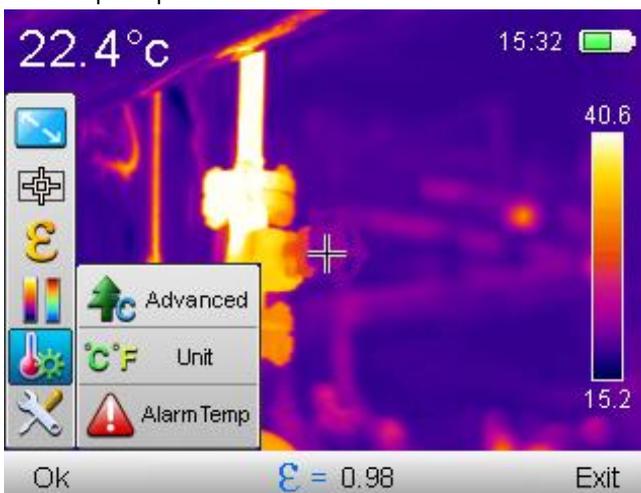
Three options are available here.

4.6.5.1 Advanced (only in KT-145)

Select 'Advanced' to pop up the window with measurement environmental conditions settings, including ambient temperature, relative humidity and distance from the measured object.
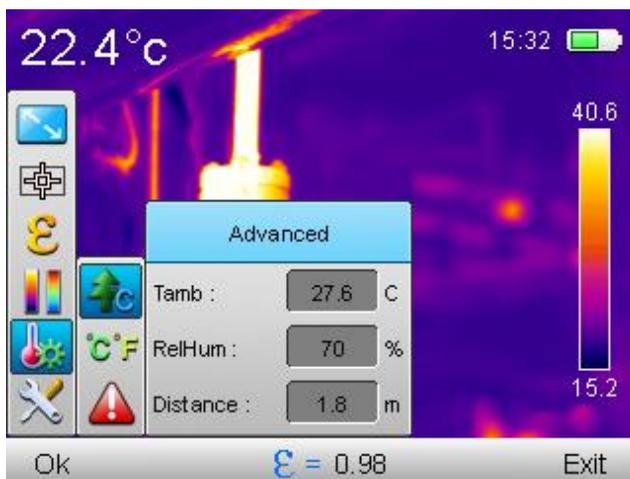
switching between the fields in done by 'up/down' buttons (➕ or ➖), editing the values is by selecting (highlighting) field that user wants to edit and by pressing 'OK' button ($\boxed{\text{➖}}$) or the 'right' ▶ button. Next to the value that is being edited, a marker is placed ⊕⊖ ,

Press 'up/down' to increase or decrease the value of the parameterł (➕ or ➖). Confirm changes by pressing 'OK' button ($\boxed{\text{➖}}$) or 'right' buton (▶),exit without saving changes by pressing 'left' button (◀). Go back to temperature measurement mode, after saving changes, by pressing 'Exit' button ($\boxed{\text{➖}}$).

4.6.5.2 °C, °F, Temperature unit selection

Select '°C, °F, Unit' to open up a window with temperature measurement unit selection.
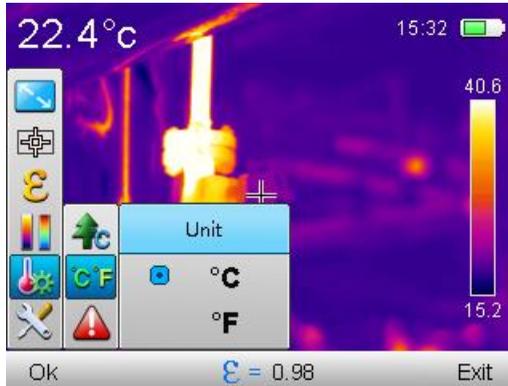
Available options are: '°C' – Celcius degrees or '°F' – Fahrenheita degrees. Make selection by pressing 'up/down' buttons (➕ or ➖). Confirm selection by pressing 'OK' buton (⬅) or 'right' buton (▶),exit without saving changes by pressing 'left' button (◀) . Go back to temperature measurement mode, after saving changes, by pressing 'Exit' button (➖) .

4.6.5.3 Temperature Alarm (only in KT-145)

Select 'AlarmTemp' to open up a window where the threshold values for minimum and maximum temperature can be set. Set High, to activate the alarm when the temperature is higher than selected value. Set Low to activate the alarm for temperatures below the selected value.:
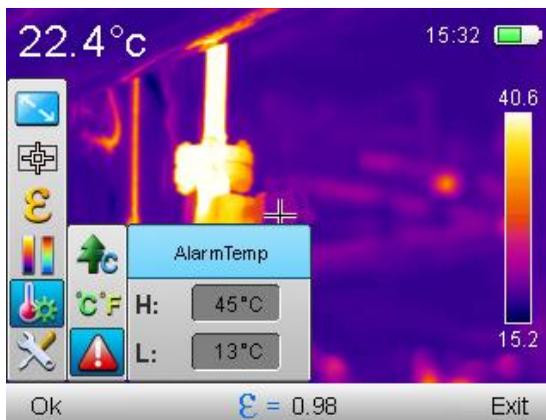
Switching between High and Low fields is done by pressing 'up/down' buttons (➕ or ➖), while editing those values is done by selecting (highlighting) field for editing and pressing

'OK' button ($\boxed{-}$) or by pressinf 'right' buton ($\blacktriangleright$).When edit mode is on, the symbol

 is displayed next to the value set for editing.,

increasing or decreasing the value of the edited parameter is done by pressing 'up/down' buttons ($+$ or $-$). Confirm selection by pressing 'OK' buton ($\boxed{-}$) or 'right' buton ($\blacktriangleright$),exit without saving changes by pressing 'left' button ($\blacktriangleleft$) . Go back to temperature measurement mode, after saving changes, by pressing 'Exit' button ($\boxed{-}$) .

Depending on the selected alarm type, moving cursor in the area analysis mode will be marking point of the highest, or the lowest temperature, changing its colors as described in 4.6.2.2 and 4.6.2.3.

4.6.6   System Settings

The main mode is displayed on the screen,
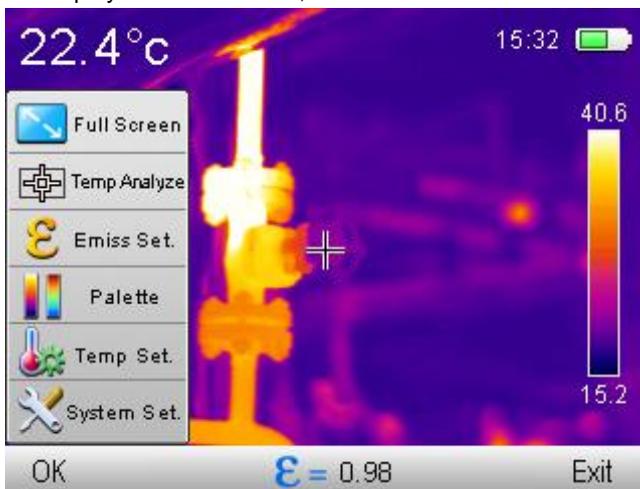
Select 'System set.' to expand drop-down configuration menu:

Several options are available for adjusting here.

4.6.6.1 Power-off

Select 'Poweroff' to open up the setting window for automatic camera switch off.

Three settings for power off mode are available:

- 'No' – auto power off mode is deactivated,
- '5 min'– the camera will switch off automatically after being idle for 5 mins,
- '20min'– the camera will switch off automatically after being idle for 20 mins.

Selection is done by pressing 'up/down' buttons ($\blacklozenge$ or $\blacksquare$). Confirm selection by pressing 'OK' buton ($\boxed{\smile}$) or 'right' buton ($\blacktriangleright$), exit without saving changes by pressing 'left' button ($\blacktriangleleft$) . Go back to temperature measurement mode, by pressing 'Exit' button ($\boxed{\smile}$).

4.6.6.2 Time / Date

Select 'TimeDate' to open up a window with time, date and date format settings:

Switching between the fields is done by pressing 'left/right' button' (◀ or ▶). When edit

mode is on, the symbol ⊕⊖ is displayed next to the value set for editing. Edited value is highlighted in blue.

increasing or decreasing the value of the edited parameter is done by pressing 'up/down' buttons (➕ or ➖). Confirm changes by pressing 'OK' buton. Go back to temperature measurement mode, without saving changes, by pressing 'Exit' button (➖).

Three date formats are available:
M/D/Y – month/day/year
Y/M/D – year/month/day
D/M/Y – day/month/year

4.6.6.3 Language

Select 'language' to open up a window with the language selection.

Selection is done by pressing 'up/down' buttons (➕ or ➖). Confirm selection by pressing 'OK' buton (➖) or 'right' buton (▶), exit without saving changes by pressing 'left' button (◀) . Go back to temperature measurement mode, by pressing 'Exit' button (➖).

The list of available languages may be different in your camera.

4.6.6.4 Brightness

Select 'Brightness' to open up a window with LCD brightness adjustment selection.

There are three modes for LCD brightness adjustment. Selection is done by pressing 'up/down' buttons (✚ or ▬). Confirm selection by pressing 'OK' buton (⟨▬⟩) or 'right' buton (▶), exit without saving changes by pressing 'left' button (◀) . Go back to temperature measurement mode, by pressing 'Exit' button (⟨▬⟩).

4.6.6.5 Default

Select 'Default' to undergo Factory Reset that will restore default settings of the camera.

Selection is done by pressing 'left/right' buttons (◀ or ▶). Confirm selection by pressing 'OK' buton (⟨▬⟩). Chosing 'OK' will restore factory settings. Select 'Exit' to go

back to the menu without restoring factory settings, Go back to temperature measurement

mode, by pressing 'Exit' button (⌐).

After selecting default settings, following parameters are switching their values into below
levels:
- emissivity: 0,98;
- distance to object: 1,8m (only in KT-145),
- ambient temperature (only in KT-145),
- palette: 2;
- relative humidity: 70% (only in KT-145),
- Temperature alarm: W: 100°C (212°F), N: 0,0°C (32°F),
- Power off: deactivated,
- temperature unit: °C,
- brightness LCD: average.

4.6.6.6 Help

Select 'Help' to open up on-screen help, that describes basic parameters and features of
the camera.
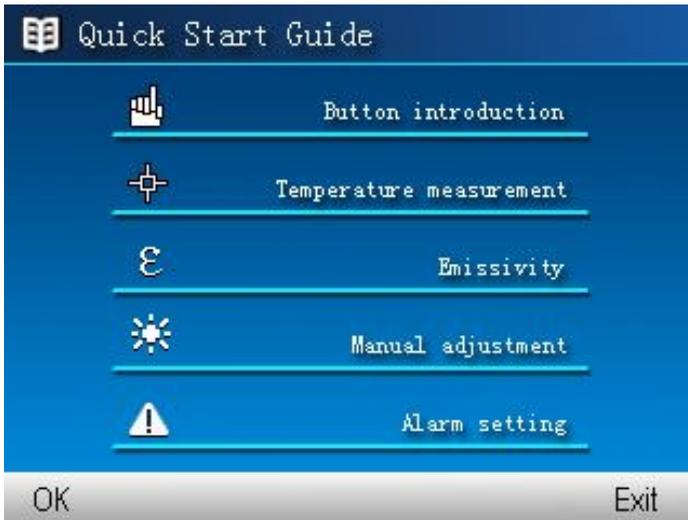
This Guide can be browsed by pressing 'left/right' buttons (◀ or ▶). Go back to tem-

perature measurement mode, by pressing 'Exit' button (⌐).

4.7 Files – browsing and deleting

With the below menu on the bottom of the screen:

Press 'view again' (button 🔲) to open up a window with the image that was saved previously:

'Exit' by pressing ⬭ to go back to temperature measurement mode.

Select '**Option'** by pressing ⬭ button, to open up option menu:

Further selection is done by pressing 'up/down' buttons (✚ or ➖). Confirm the selection by pressing 'OK' buton (⬡). Press 'Delete' to open up window asking to confirm deletion:
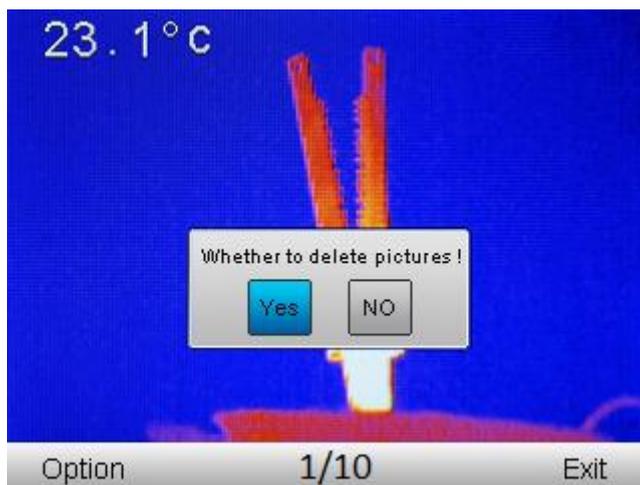
Changes are done by pressing 'left/right' buttons (◀ or ▶). Confirm changes by pressing 'OK' buton (⬡). Choose 'Yes' to remove selected image. Select 'No' to return to image viewing without making changes in the camera's memory. Go back to temperature measurement mode, by pressing 'Exit' button (⬡).

Select '**Thumbnails'** to see the preview versions of the registered and saved images:
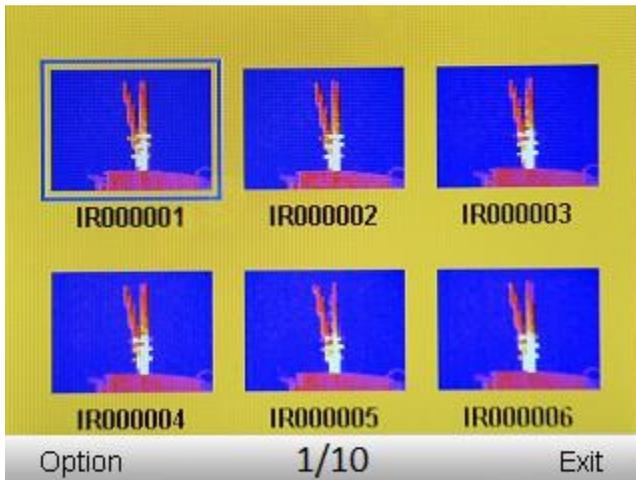
Navigate through thr list by pressing 'up/down' buttons (✚ or ➖) and 'left/right' buttons
(◀ or ▶), Select the picture of your interest, and on the bottom bar information on the
number of the selected picture, and the total number of saved pictures, will be displayed.

"Go back to temperature measurement mode, by pressing 'Exit' button ($\boxed{➖}$).

Select '**Option'** by pressing $\boxed{➖}$ buton, to open up the menu options:
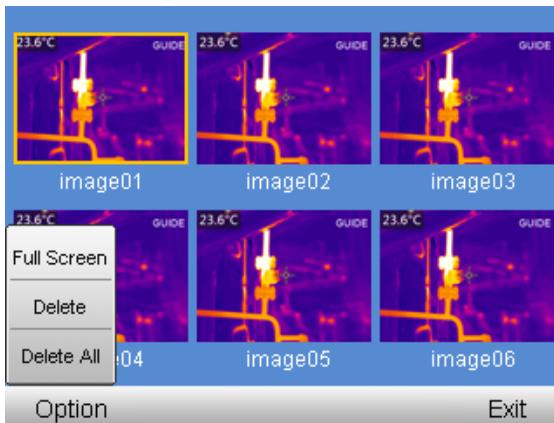
Further selection is done by pressing 'up/down' buttons (✚ or ➖). Confirm the selec-
tion by pressing 'OK' buton ($\boxed{➖}$).

Select 'Full Screen' to get the preview of the selected picture in full screen mode.

Select 'Delete" to open up a window which allows to delete single image. Select delete all
to open up similar window, that allows to delete all images stored in the memory.
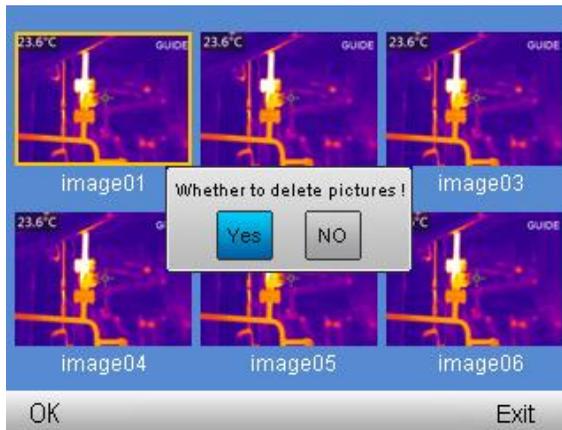
Changes are done by pressing 'left/right' buttons (or). Confirm changes by pressing 'OK' buton ( ). **IMPORTANT: selecting 'Yes' will delete all images stored on the SD card.** Select 'No' to go back to image viewing without doing any changes on memory card.

Select 'Full Screen' to get the preview on the selected image in full screen mode.

4.8 Information on hardware and firmware version

With the below menu on the bottom of the screen:

Press and hold 'right' buton (▶) for about 4 seconds, to make the bar with the firmware and hardware version appear in the down middle of the screen.
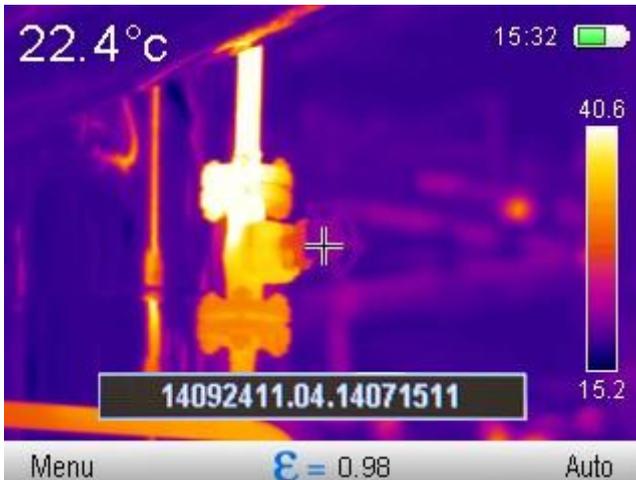
Release the buton to make the bar disappear.

4.9   SD card

Thermal images are stored on removable SD card (max. 32GB). The card must be format-ted in FAT32 file format. SD card used for storing thermal images must not be used for any other purpose. Failing to obey this rule may result in the loss of the stored thermal da-ta.

SD card slot is locaded in the camera's handgrip, next to the battery.
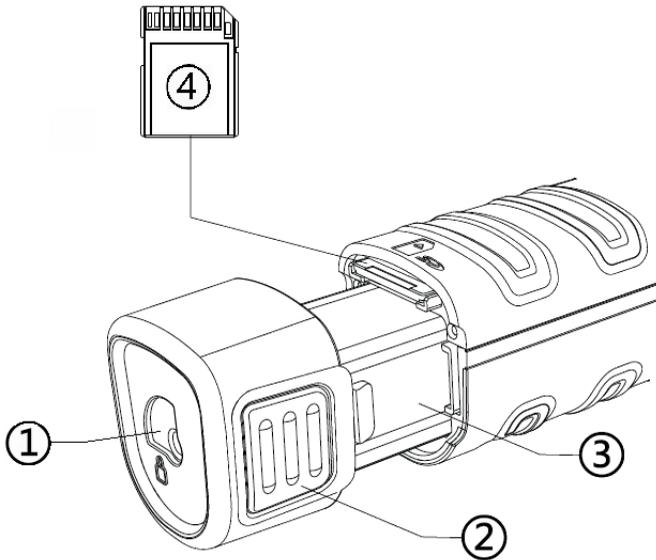
In order to mount/unmount SD card all the following steps must be done with switched on camera:

- Slide the hooks securing the battery (1) into unlocked position,

- Clutch the battery holders (2) evenly on both sides and extend the battery until the bat-tery body (3) is outside the camera,

- When inserting the SD card make sure it's positioned properly. Insert the card into SD card slot until 'click' sound is heard. Card removal: press the available part of the card gently into the card slot until hearing 'click' sound. The card can be removed now,

- Slide the battery back until holders' 'click' sound is heard.   ,

- set the hooks securing the battery into BLOCKED position (towards closed padlock).

At certain times of camera usage (for example – after SD card replacement, connec-tion/disconnection of USB cable) a note saying 'SD card initiation' may appear on the screen. This happens when the camera is installing SD card, and it will disappear auto-matically upon completing the procedure.

When there is no SD card inserted, the camera will indicate it by displaying [symbol] symbol on the screen.

4.10 Power supply, charging batteries

The camera is powered by 3,7V 4200mAh buttery. It can also be powered from mains through AC adapter.
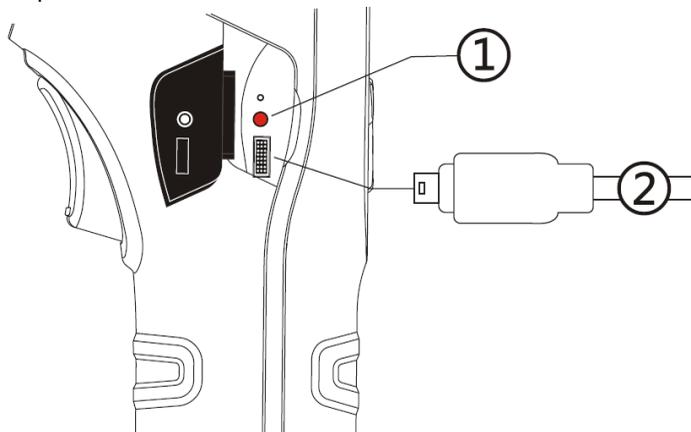
1 – LED charging indicator (also for USB charging).
2 – micro USB port for USB power adaptor connection.

The batteries in KT series can be charged while being inside of the camera - through AC adapter connected into micro USB port while the camera is off.
Charging can be performed only when the camera is not being used.
If the camera is not to be used for several weeks, it's advised to recharge its batteries eavery couple of weeks. If the device is unused for an extended period, remove the battery and store it separately.
During camera operation, current power supply source indicator is displayed in the upper right corner of the screen.

4.10.1 Battery installation/removal

The battery is located inside the camera's handgrip. No tool is needed to install/remove the battery.
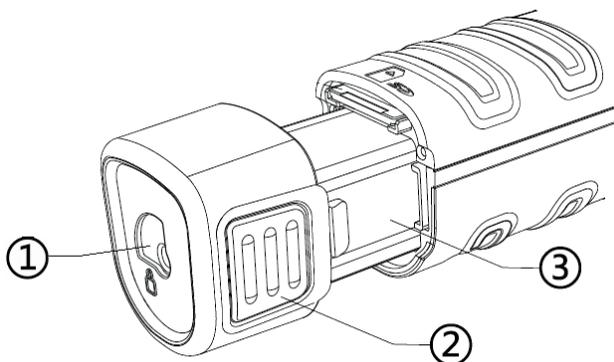
In order to install/remove battery all the following steps must be done with switched on camera):
- Slide the hooks securing the battery (1) into unlocked position,
- Clutch the battery holders (2) evenly on both sides and extend the battery until the battery body (3) is outside the camera.
In order to install the battery repeat above process in reversed order. Always make sure that hooks securing the battery are locked in BLOCKED position (towards closed padlock).

4.10.2 Using AC adapter

The adapter must be connected to mains socket, and then connected with the camera via USB cable supplied with the camera.

Connecting AC adapter is signalled by LED indicator. When the camera is turned off, the indicator shows battery charging status. After switching on the camera (press and hold buton for 3 seconds) the indicator will show that camera is powered by AC adapter) batteries are not being charged). Switching off the camere again (provided the AC adapter has not been disconnected), will result in the indicator showing that battery charging is on.

AC adapter, when not used, should be disconnected from the camera and from the mains.

4.10.3 Battery power supply

After turning on battery powered camera, battery charge level indicator is displayed in the upper left corner of the screen.
During camera operation the battery charge level is being shown in real time:

Max.   min.

4.10.4 Charging batteries

NOTE!
When using for the first time the battery should be charged with the use of USB charger, that is supplied with each camera, for at least 4 hours. The camera should be switched off when charging.

When the camera is turned off, and the battery is inside, connecting the AC adapter and starting the charging procedure is signalled by the LED charging indicator next to micro USB port. When fully charged, LED indicator is turning off.
Rapid LED indicator's flashing during charging process indicates malfunction occurance (i.e. broken batteries). In this situation, the charging procedure has to be stopped, and the

reason for malfunction must be identified.

In case the charging malfuncion was caused by the overheated bateries, the charging has to be stopped until the batteries cool down.

NOTE!
Use only the AC adapter supplied with the camera.

NOTE!
Do not remove the battery from the camera while it's being charged.

NOTE!
Use only the batteries supplied by the manufacturer with the camera.

NOTE!
Battery charging should be performed in 0...40°C temperature range.

NOTE!
In order to maintain the proper parameters of the batteries, charging of unused batteries should be repeated every 3 months.

4.10.5 General rules of using Lithium (Li-On) batteries.

If the device is unused for an extended period, remove the battery and store it separately. The battery stored in state of deep discharge can get permanently damaged.

The battery should be stored in dry, cool and well-ventilated place and it should be protected from exposure to direct sunlight. If the battery is stored for an extended period at a location with high temperature in it, then the chemical processes occuring within it may shorten its expected life span.

Do not charge and use Li-On batteries in extreme temperatures (don't overheat and dont expose the batteries to very low temperatures). Extreme temperatures decrease battery life. Avoid placing devices powered with rechargeable batteries in very warm/hot places. Their nominal working temperature must be strictly observed.

Li-Ion batteries are vulnerable to mechanical damages. Such damages can contribute to permanent damage of those type of batteries, and thus the ignition. Any interference in the structure of the battery may lead to its damage. Shorting poles (+ and -) of the battery may cause permanent damage and auto-ignition of the battery.

Do not immerse the Li-Ion batteries in liquids, do not store them in conditions of high humidity.

In case the electrolyte, that is filling the inside of the Li-Ion battery, makes direct contact with eyes or skin, rinse them with a large amount of water and contact your doctor immediately. The battery should be used in a way, that makes it beyond access for random people. Keep it away from children.

Whenever any changes in Li-Ion battery is observed (different color, swelling, excessive temperature), it must cease to be used. Mechanically damaged, overcharged or deeply discharged batteries are not suitable for use.

4.11 Installing camera driver

4.11.1 Hardware requirements
Operating system: Microsoft® Windows XP or higher (recommended Windows 7 or higher)
Processor: Pentium 4 2.4 GHz or higher
RAM: at least 512 MB

4.11.2 Installation
It is advised to install Sonel ThermoAnalyze 2 programme before connecting the camera to the PC (camera's drivers install themselves automatically with Sonel ThermoAnalyze 2).

After inserting the CD containing the software (supplied with your camera) into CD-ROM drive, installation dialog box will appear. If the installation box doesn't appear automatically, double-click "autorun.exe" file in the CD's main folder.

After selecting language, a window is opened, where 'Thermal Imagers' should be selected, and then Sonel ThermoAnalyze 2 must be installed. The installer will start. All necessary system modules (by Microsoft®) will be installed in the first place, followed by Sonel ThermoAnalyze 2. Follow on-screen instructions.
When the installation is completed the camera can be connected to USB port on your PC. In order to transfer images stored on SD card to PC's hard drive, follow description in 4.12. In order to transfer thermal image, follow description in 4.13.

In case the original CD, supplied with the camera, is missing, the installation procedure can be completed with the installation files downloaded from www.sonel.pl/en.

4.12 Reading data from external memory (SD card)
The content stored on SD card can be read by connecting the camera to PC using USB cable, or by removing the card from the camera, and using external SD card reader.

USB port symbol usb will apprear on the screen upon connecting the camera to PC via USB port. The SD card will install itself automatically on the system, and after the installation is completed it will be recognied as one another hard drive installed on the computer. It's name will be the same as the original name of the card.
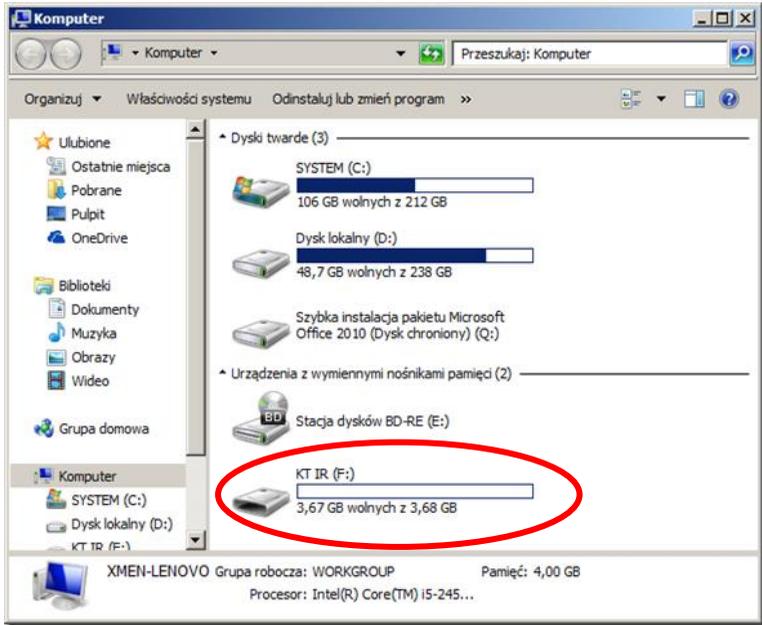
Files containing thermograms are located in the following directory: (hard drive letter):\DCIM\PICTURE\.
Selected or all files should be copied into computer's hard drive.

It is advised to copy files into 'All files' directory in Sonel ThermoAnalyze2 folder. Standard location: C:\Program Files\Sonel\Sonel ThermoAnalyze2\All Files\

4.13 Transfering thermal image via USB (only in KT-145)

In order to be able to transfer real time infrared footage, SD card must be removed from the camera. Then the camera must be switched on. Missing SD card symbol ▯ will appear on screen. Connect the camera to USB port on your computer and run Sonel ThermoAnalyze2 programme.

USB symbol ⟨USB⟩ will appear on the camera's screen. In Sonel ThermoAnalyze2 select 'Video', and then 'camera type': KT-145.
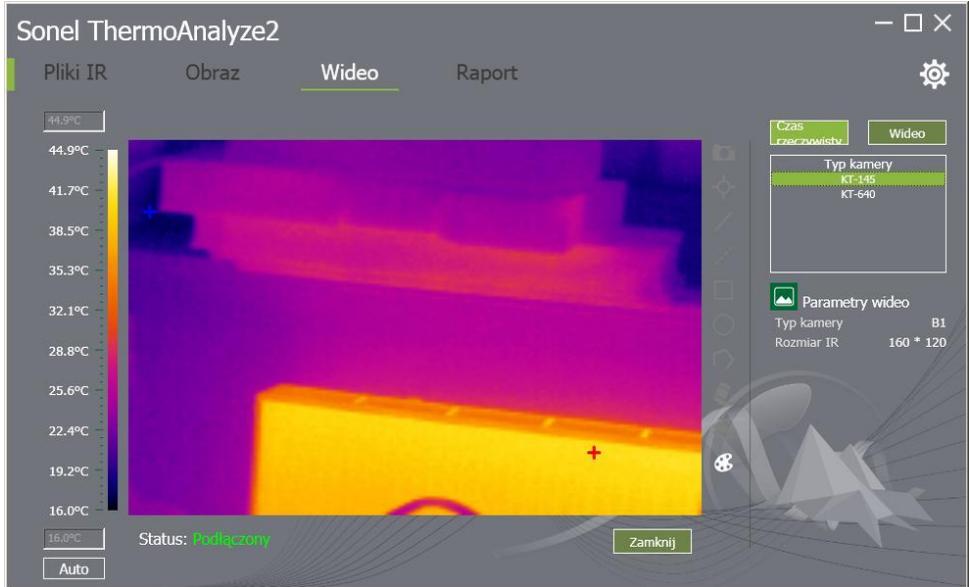
Further instructions are described in Sonel ThermoAnalyze2 user manual.

4.14 Data analysis

A PC software, 'Sonel ThermoAnalyze 2', that is supplied with the camera, allows to perform detailed analysis of the recorded thermal images, followed by generating thermal inspection report. Detailed description of the software's features is included in a separate 'Sonel ThermoAnalyze' user manual.

5 Specifications

Model (version)	KT-145v11	KT-145v30	KT-80
Lens	11 mm	30 mm	8 mm
Thermal			
Detector resolution	160 × 120 pixels		80 × 80 pixels
Spectral range	8~14 цm		
Focus	Manual		
Focal lenght / Field of View	11 mm / 15.5°x 20.6°	30 mm / 5.7° x 7.6°	8mm / 18.5° x 18.5°
Thermal Sensivity	≤0.08°C @30°C		
Zoom	X2		-
Palettes	6		4
Interface	Mikro-USB		
Image Presentation			
Display	LCD		
	3.5'' LCD (320 x 240 pixels)		
	Three step LCD backlit		
Frequency	50 Hz		
Measurement			
Accuracy	±2°C or ±2% of reading (for ambient temperature from range 10…35°C, otherwise ±3°C or ±3% of reading), distance 1 m-5 m		
Temperature Range	-20°C …+350°C		0°C …+250°C
Measurement conditions correction	Emissivity (0.01-1.00)		
	Ambient temperature		-
	Distance		
	Relative humidity		
Measurement Features			
Point	Central		
Max	Max temp. point		
Min	Min temp. point		
Alarm	Alarm for min. temperature		-
	Alarm for max. temperature		-
Thermal pictures			
File format	JPG		
Storage	removable SD card		

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Power Supply	
Battery type	3,7 V 4200 mAh Li-Ion
Charging	Built-in (in camera) or external charger
External power supply	AC 110/230 V AC, 50/60 Hz
Battery Operating Time	over 4 hours
Physical Characteristics / Environmental Specifications	
Encapsulation	IP43
Size	103 mm x 98 mm x 258 mm
Weight	755 g
Operating Temperature	-10°C ... 50°C
Storage Temperature	-20°C ... 60°C
Humidity	10% to 95%, without condensation
Shock	25G, IEC 68-2-29
Vibration	2G, IEC 68-2-6

6 Examplary Emissivity Coefficient Values

aluminum	0.05	lead: polished	0,08
aluminum Rough	0,07	lead: grey	0,28
Aluminum oxidized	0,25	lead: oxidized	0,63
asphalt	0,90	paper white	0,90
asbestos board	0,96	paper black glossy	0,90
asbestos (fiber)	0,78	paper black dull	0,94
akelite	0,93	paper: tarred	0,92
bronze: dull	0,22	plastic: black	0,95
bronze: polished	0,10	platinum	0,10
bronze: rough	0,55	porcelain: glazed	0,92
brick: glass, rough	0,85	mercury	0,10
brick: fireproof, rough	0,94	lampblack	0,96
cement	0,54	silver	0,03
cement (concrete)	0,90	steel: galvanized	0,28
chrome	0,15	steel: oxidized	0,88
chrome polished	0,10	steel: rolled freshly	0,24
tin	0,09	steel: rolled	0,56
zinc	0,05	steel: rough	0,96
brick red	0,93	steel: rusty red	0,69
paint: oil	0,94	steel nickeled	0,11
clay: fired	0,91	glaze	0,90
clay	0,40	glass	0,92
graphite	0,85	glass dull	0,96
ground: frozen	0,93	snow	0,80
rubber	0,93	tape insulation	0,95
cobalt	0,18	fabric	0,85
quartz	0,93	titanium	0,30
lacquer white	0,87	carbon	0,90
lacquer polished black	0,87	charcoal powder	0,96
lacquer dull black	0,97	tungsten	0,13
lacquer silver	0,31	tungsten: oxidized	0,11
ice	0,97	gold	0,02
magnesium	0,12	iron: glossy	0,16
copper: oxidized	0,65	iron: heat rolled	0,77
copper: oxidized black	0,88	iron: oxidized	0,74
copper: polished	0,07	iron: polished	0,23
copper: polished annealed	0,01…0,02	iron and steel: oxidized	0,85
brass	0,10	cast: raw casting	0,81
brass: oxidized	0,61	cast: polished	0,21
nickel : polished	0,05		

Values given above can vary depending on the conditions in which measurements were taken.

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7 Cleaning and maintenance

<div style="border: 2px solid red;">

NOTE!
Use the below specified methods of maintenance only.

</div>

Camera enclosure - all surfaces, except for optical elements of the camera, can be cleaned with a soft and moist cloth with generally available mild detergents. Do not use any solvents or cleaning agents that could scratch the enclosure (powder, paste, etc.). During cleaning, the camera must be turned off.

Due to the applied anti-reflective coating, optical lens are the most sensitive and at the same time the most expensive part of the camera (the lens is of key importance to radiometric capabilities of the infrared system). Therefore it is important to close the protective lens cover after each use of the camera. Optical surfaces should be cleaned only, when they are visibly fouled. Do not touch exposed surfaces of optical lens with fingers, because fouling left with fingerprints can be harmful to coatings and glass of the lens.

Chemical agents must not be used for cleaning the optical viewfinder, and particularly optics and accessories of the camera. Use a clean, dry and soft cloth for cleaning the body of the viewfinder; for cleaning the lens, use only the supplied lens cleaning cloth.

8 Service and storage

KT-145 and KT-80 thermal imaging cameras don't comprise any parts serviceable by the user. Do not attempt to dismantle or modify the camera on your own. Opening the instrument voids the warranty.

When storing the instrument, observe the following guidelines:

- make sure the camera and its accessories are dry,
- when storing the camera for a prolonged time, remove the batteries,
- allowed are storage temperatures specified in technical specifications,
- in order to avoid complete discharging of rechargeable batteries during prolonged storage, charge them once in a while.

9 Accessories

The current list of accessories can be found on the manufacturer's website.

9.1 Standard accessories – KT-80

Standard bundle supplied by the manufacturer includes:

- KT-80 Thermal Imager
- SD card – **WAPOZSD1**
- Li-Ion battery 3,7 V 4,2 Ah – **WAAKU13**
- Power Adapter 100~240V (with adapters for different sockets)
- USB-microUSB cable – **WAPRZUSBMICRO**
- User manual
- Sonel ThermoAnalyze2 User Manual
- Hand strip – **WAPOZPAS1**
- Calibration certificate issued by an accredited laboratory

9.2 Standard accessories – KT-145

Standard bundle supplied by the manufacturer includes:

- KT-145 Thermal Imager
- SD card – **WAPOZSD1**
- Li-Ion battery 3,7 V 4,2 Ah – **WAAKU13**
- Power Adapter 100~240V (with adapters for different sockets)
- USB-microUSB cable – **WAPRZUSBMICRO**
- User manual
- Sonel ThermoAnalyze2 User Manual
- Hand strip – **WAPOZPAS1**
- Carrying case – **WAFUTM7**
- Calibration certificate issued by an accredited laboratory

9.3 Optional accessories

- Wi-Fi SD card 4 GB
  WAPOZSDWIFI4

- Wi-Fi SD card 8 GB
  WAPOZSDWIFI8

- L3 carrying case
  WAWALL3

- Carrying case
  WAFUTM7

- External battery charger
  WAZASZ12

* exemplary images - actual apperance of the supplied items may be different from those shown above.

10 Dismantling and disposal

Used-up electrical or electronic equipment must be collected selectively, i.e. must not be mixed with waste of other types.

Used-up electronic equipment must be delivered to an appropriate collection centre in accordance with regulations related to used-up electrical or electronic equipment.

Before delivering the equipment to the collection centre do not attempt to dismantle any of its parts.

> **NOTE:**
> **Follow local regulations related to disposing of packaging,**
> **used-up batteries and rechargeable batteries.**

11 Manufacturer

The manufacturer and provider of warranty and post-warranty services for the instrument is:

SONEL S.A.
Wokulskiego 11
58-100 Świdnica
Poland
tel. +48 74 858 38 60
fax +48 74 858 38 09
E-mail: export@sonel.pl
Web page: www.sonel.pl

> **NOTE:**
> **Only the manufacturer is authorized**
> **to provide repair service.**

12 Laboratory services

SONEL Testing and Calibration Laboratory has been accredited by the Polish Center for Accreditation (PCA) - certificate no. AP 173.

Laboratory offers calibration for the following instruments that are used for measuring electrical and non-electrical parameters.

- **METERS FOR MEASUREMENTS OF ELECTRICAL PARAMETERS**
    - voltage meters,
    - current meters (including clamp meters),
    - resistance meters,
    - insulation resistance meters,
    - earth resistance and resistivity meters,
    - RCD meters,
    - short-circuit loop impedance meters,
    - power quality analyzers,
    - portable appliance testers (PAT),
    - power meters,
    - multimeters,
    - multifunction meters covering the functions of the above-mentioned instruments,

- **ELECTRICAL STANDARDS**
    - calibrators,
    - resistance standards,

- **METERS FOR MEASUREMENTS OF NON-ELECTRICAL PARAMETERS**
    - pyrometers,
    - thermal imagers,
    - luxmeters.

The **Calibration Certificate** is a document that presents a relation between the calibration standard of known accuracy and meter indications with associated measurement uncertainties. The calibration standards are normally traceable to the national standard held by the National Metrological Institute.

According to ILAC-G24 „Guidelines for determination of calibration intervals of measuring instruments", SONEL S.A. recommends periodical metrological inspection of the instruments it manufactures no less frequently than once every **12 months**.

For new instruments provided with the Calibration Certificate or Validation Certificate at the factory, re-calibration should be performed within **12 months** from the date of purchase, however, no later than **24 months** from the date of purchase.

ATTENTION !
The person performing the measurements should be absolutely sure about the efficiency of the device being used. Measurements made with an inefficient meter can contribute to an incorrect assessment of the effectiveness of health protection and even human life.

NOTES
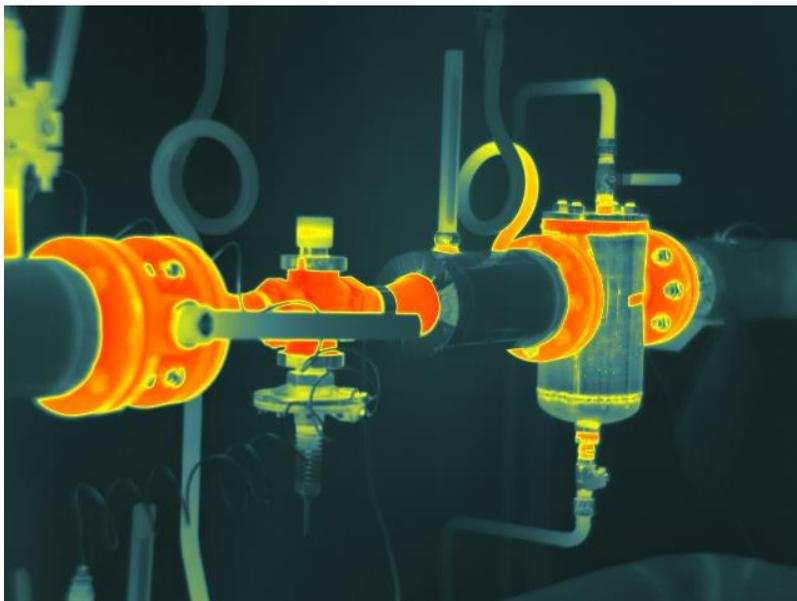
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