



testo 871s thermal imager

Instruction manual



Analysis software
testo IRSoft

Use the testo IRSoft software to analyze your thermal images extensively and in detail, and to create professional reports. You can download the software free of charge and licence-free via the following link:



www.testo.com/irsoft



testo Thermography App

Use the testo Thermography App to transfer thermal images live to your smartphone/tablet and create quick analyses and simple reports directly on site.

Download the app free of charge for Android or iOS from the app store:
testo Thermography App



Contents

| | | |
|----------|---|-----------|
| 1 | Safety and disposal | 3 |
| 1.1 | About this document..... | 3 |
| 1.2 | Security | 3 |
| 1.3 | Disposal | 4 |
| 2 | Technical data | 5 |
| 2.1 | Bluetooth module | 5 |
| 2.2 | General technical data | 5 |
| 3 | Description of the instrument | 9 |
| 3.1 | Use..... | 9 |
| 3.1 | Instrument / operating elements overview | 9 |
| 3.1 | Displays overview..... | 10 |
| 3.2 | Power supply..... | 11 |
| 4 | Operation | 12 |
| 4.1 | Commissioning..... | 12 |
| 4.2 | Switching instrument on and off | 12 |
| 4.3 | Getting to know the menu | 13 |
| 4.4 | Quick select button..... | 14 |
| 5 | WLAN connection - using the App | 16 |
| 5.1 | Activating/disabling the connection | 16 |
| 5.2 | Using the App..... | 16 |
| 5.2.1 | Establishing a connection..... | 16 |
| 5.2.2 | Select display | 17 |
| 6 | Bluetooth® connection | 18 |
| 7 | Performing the measurement | 19 |
| 7.1 | Setting measuring functions | 20 |
| 7.1.1 | Activating/disabling Pixel mark | 20 |
| 7.1.2 | Activating the differential temperature | 21 |
| 7.1.3 | Activating external values..... | 22 |
| 7.2 | Saving an image..... | 22 |
| 7.3 | Image gallery..... | 23 |
| 7.4 | Setting the scale..... | 25 |
| 7.5 | Setting emissivity and reflected temperature..... | 27 |
| 7.5.1 | Selecting the emissivity | 29 |
| 7.5.2 | Customizing the emissivity | 29 |

Contents

| | | |
|-----------|--|-----------|
| 7.5.3 | Setting RTC | 29 |
| 7.5.4 | Setting ϵ -Assist | 29 |
| 7.6 | Selecting the colour palette | 30 |
| 7.7 | Image type | 30 |
| 7.8 | Configuration | 30 |
| 7.8.1 | Settings..... | 30 |
| 7.8.2 | SuperResolution | 31 |
| 7.8.3 | Save JPEG | 31 |
| 7.8.4 | Connectivity | 32 |
| 7.8.5 | Configure key..... | 32 |
| 7.8.6 | Ambient conditions | 32 |
| 7.8.7 | Info..... | 33 |
| 7.8.8 | Certificates..... | 33 |
| 7.8.9 | Fullscreen mode | 33 |
| 7.8.10 | Reset options..... | 34 |
| 8 | Maintenance | 35 |
| 8.1 | Charging the rechargeable battery | 35 |
| 8.2 | Changing the rechargeable battery..... | 35 |
| 8.3 | Cleaning the instrument..... | 37 |
| 8.4 | Firmware update..... | 38 |
| 8.4.1 | Performing an update using IRSoft..... | 38 |
| 8.4.1.1 | Preparing the camera | 38 |
| 8.4.1.2 | Performing an update | 38 |
| 8.4.2 | Performing an update with the camera | 39 |
| 8.4.2.1 | Preparing the camera | 39 |
| 8.4.2.2 | Performing an update | 39 |
| 9 | Tips and assistance..... | 40 |
| 9.1 | Questions and answers | 40 |
| 9.2 | Accessories and spare parts..... | 40 |
| 10 | Authorisations and certification..... | 41 |

1 Safety and disposal

1.1 About this document

- The instruction manual is an integral part of the instrument.
- Keep this documentation to hand so that you can refer to it when necessary.
- Always use the complete original instruction manual.
- Please read this instruction manual through carefully and familiarize yourself with the product before putting it to use.
- Hand this instruction manual on to any subsequent users of the product.
- Pay particular attention to the safety instructions and warning advice in order to prevent injury and damage to the product.

1.2 Security

General safety instructions

- Only operate the product properly, for its intended purpose, and within the parameters specified in the technical data.
- Do not apply any force.
- Do not operate the instrument if there are signs of damage on the housing, mains unit or connected cables.
- Dangers may also arise from objects to be measured or the measuring environment. Always comply with the locally valid safety regulations when carrying out measurements.
- Do not store the product together with solvents.
- Do not use any desiccants.
- Only perform maintenance and repair work on this instrument that is described in this documentation. Follow the prescribed steps exactly when doing the work.
- Use only original spare parts from Testo.
- Only use the original mains unit from Testo.
- During operation, this instrument must not be pointed at the sun or other intensive sources of radiation (e.g. objects with temperatures exceeding 650 °C). This can cause serious damage to the detector. The manufacturer does not provide any warranty for any such damage to the microbolometer detector.

Batteries



- Improper use of batteries may cause the batteries to be destroyed, or lead to injury due to current surges, fire or escaping chemicals.

1 Safety and disposal

- Only use the batteries supplied in accordance with the instructions in the instruction manual.
- Do not short-circuit the batteries.
- Do not take the batteries apart and do not modify them.
- Do not expose the batteries to heavy impacts, water, fire or temperatures in excess of 60 °C.
- Do not store the batteries in the proximity of metal objects.
- In the event of contact with battery acid: rinse affected areas thoroughly with water, and if necessary consult a doctor.
- Do not use any leaky or damaged batteries.
- Only charge the rechargeable battery in the instrument or in the recommended charging station.
- Immediately stop the charging process if this is not completed in the given time.
- Take the rechargeable battery out of the instrument immediately if it is not functioning properly or if it shows signs of superheating. Rechargeable battery may be hot!
- When not in use for a long period of time, take the rechargeable battery out of the instrument to prevent exhaustive discharge.

Warnings

Always pay attention to any information denoted by the following warnings. Implement the precautionary measures specified!

| Display | Explanation |
|--|---|
|  WARNING | Indicates possible serious injury. |
|  CAUTION | Indicates possible minor injury. |
| ATTENTION | Indicates possible damage to equipment. |

1.3 Disposal

- Dispose of faulty rechargeable batteries and spent batteries in accordance with the valid legal specifications.
- At the end of its useful life, deliver the product to the separate collection point for electric and electronic devices (observe local regulations) or return the product to Testo for disposal.

2 Technical data

2.1 Bluetooth module



The use of the wireless module is subject to the regulations and stipulations of the respective country of use, and the module may only be used in each case in countries for which a country certification has been granted.

The user and every owner undertake to adhere to these regulations and prerequisites for use, and acknowledge that the re-sale, export, import, etc. in particular in, to or from countries without wireless permits, is their responsibility.

2.2 General technical data

Infrared image output

| Feature | Values |
|--|-----------------------------|
| Infrared resolution | 240 x 180 |
| Thermal sensitivity (NETD) | < 80 mK |
| Field of view (FOV) / min. focusing distance | 35° x 26° / <0.5 m |
| Geometric resolution (IFOV) | 2.6 mrad |
| SuperResolution | 480 x 360 pixels / 1.6 mrad |
| IR image refresh rate | 9 Hz |
| Spectral range | 7.5 - 14 µm |

Visual image output

| Feature | Values |
|-------------------------------------|-----------------|
| Image size / min. focusing distance | 5.0 MP / <0.5 m |
| Focus | Fixed focus |

Image presentation

| Feature | Values |
|-----------------|--|
| Display | 8.9 cm (3.5") TFT, QVGA (320 x 240 pixels) |
| Display options | - Infrared image - Real image |

2 Technical data

| | |
|-----------------|--|
| Colour palettes | 4 options: <ul style="list-style-type: none">- Grey- Cold-hot- Iron- Rainbow HC |
|-----------------|--|

Measurement

| Feature | Values |
|---|--|
| Measuring range | --30 to +100 °C; 0 to +650 °C, manual or automatic switch-over |
| Accuracy | --30 to -20 °C: ± 3 °C, otherwise ± 2 °C, ± 2 % of measured value |
| ϵ -Assist | included |
| Emissivity/reflected temperature adjustment | 0.01 to 1/manual |
| Analysis functions | <ul style="list-style-type: none">- Center spot- Hot/cold spot detection- Delta T |
| IFOV warning | Included in the scope of delivery |
| testo ScaleAssist | Included in the scope of delivery |
| Humidity measurement | Manual or with testo 605i thermohygrometers |
| Electrical mode | Manual input of current, voltage or power or automatic transmission of data from the testo 770-3 clamp meter via Bluetooth |
| Solar mode | Manual input of the solar radiation value |


Imager features

| Feature | Values |
|-------------------|--|
| Digital camera | Included in the scope of delivery |
| Fullscreen mode | Included in the scope of delivery |
| Save JPEG | Included in the scope of delivery |
| Video streaming | via USB |
| Interfaces | USB 2.0 micro B |
| WLAN Connectivity | Communication with the testo Thermography App Wireless LAN module (EU, EFTA, USA, AUS, CDN, TR) |
| Bluetooth® | Transfer of data from testo 605i thermohygrometer, testo 770-3 clamp meter (optional) Radio authorization in EU, EFTA, USA, Canada, Australia, Turkey |

Image storage

| Feature | Values |
|-----------------|--|
| File format | <ul style="list-style-type: none"> - .jpg - .bmt - Can export as .bmp .jpg .png .csv .xls |
| Memory capacity | Internal mass storage > 1000 images (without SuperResolution) |

Power supply

| Feature | Values |
|-----------------------------------|---|
| Battery type | Li-Ion rechargeable battery 2600 mAh / 3.63 V |
| Operating time | 4.0 h @ 20 °C |
| Mains operation | Yes |
| Charging option | In instrument/in charging station (optional) |
| Charging time in the instrument | Approx. 3 h with 2A mains unit supplied |
| Charging time in charging station | Approx. 5 h via mains unit |
| USB interface | 5V  1.8 A* |

*  Direct current

Ambient conditions

| Feature | Values |
|--------------------------|------------------------------|
| Operating temperature | -15 to +50°C |
| Storage temperature | -30 to +60°C |
| Humidity | 20 - 80 %RH, not condensing |
| Housing protection class | IP54* according to IEC 60529 |
| Vibration | 2 g |
| Max. Operating height | 2000 m |

* The product offers IP54 protection, but is not suitable for permanent outdoor use.

Standards, tests

| Feature | Values |
|---------|------------|
| EMC | 2014/30/EU |
| RED | 2014/53/EU |

2 Technical data



You can find the EU declaration of conformity on the Testo website, www.testo.com, under the product-specific downloads.

3 Description of the instrument

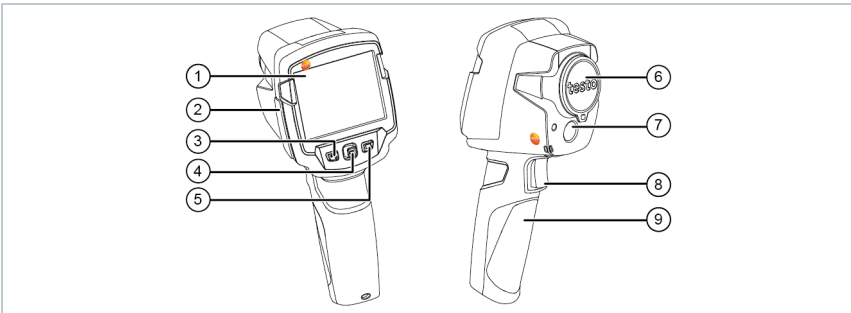
3.1 Use



The instrument is a handy, robust thermal imager. You can use it to undertake the non-contact measurement and display of surface temperature distribution.

Areas of application

- Building inspection: Energy efficiency rating of buildings (heating, ventilation, air-conditioning trade, building engineers, engineering firms, experts)
- Production monitoring / quality assurance: monitoring of production processes
- Preventive maintenance / servicing: Electrical and mechanical inspection of systems and machines

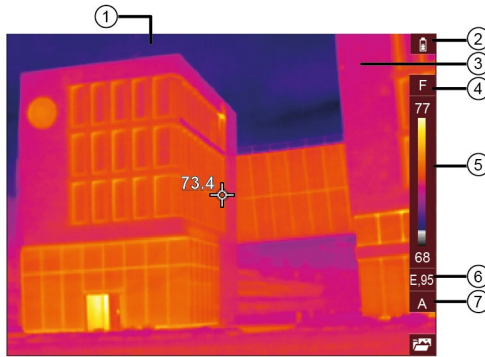
3.1 Instrument / operating elements overview










| Element | Function |
|--|--|
| 1 Display | Displays infrared and real images, menus and functions |
| 2 Interface terminal | Contains micro USB interface for power supply and connection to the computer |
| 3 -  key - Esc key | - Switch camera on and off - Cancel action |
| 4 - OK key - Joystick | - Open menu, select function, confirm setting - Navigate within the menu, highlight function, select colour palette |
| 5 Quick select button  | Opens the function assigned to the quick select button; the icon for the selected function is displayed bottom right |

| Element | Function |
|--|--|
| 6 Infrared camera lens; protective cap | Takes infrared images; protects the lens |
| 7 Digital camera | Takes real images |
| 8 Trigger | Saves the displayed image |
| 9 Battery compartment | Contains the rechargeable battery |

3.1 Displays overview



| Element | Function |
|---|--|
| 1 Status bar | In the status bar, values are displayed depending on the setting. |
| 2  | Battery capacity / charge status:  : Battery operation, capacity 75-100%  : Battery operation, capacity 50-75%  : Battery operation, capacity 25-50%  : Battery operation, capacity 10-25%  : Battery operation, capacity 0-10%  : Mains operation, battery is charging |
| 3 Image display | IR image or real image display |
| 4 °C or °F | Unit set for reading and scale displays |

| | Element | Function |
|---|-----------|---|
| 5 | Scale | <ul style="list-style-type: none"> - Temperature unit - temperature margin of the image displayed, showing the minimum/maximum reading (with automatic scale adjustment) or the selected minimum/maximum display value (with manual scale adjustment) |
| 6 | E ... | Emissivity set |
| 7 | A, M or S | A - automatic scale adjustment M - manual scale adjustment S - ScaleAssist is enabled |

3.2 Power supply

The power is supplied to the instrument via a replaceable rechargeable battery or the mains unit provided (battery must be inserted).

With an attached mains unit, power is supplied automatically via the mains unit and the rechargeable battery is charged (only at ambient temperatures from 0 to 40°C). Operation is possible with the mains unit connected.

It is also possible to charge the battery using a charging station (accessory).

The instrument is equipped with a buffer battery to maintain the system data during an interruption in the power supply (e.g. when the battery is changed).

4 Operation

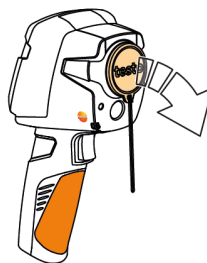
4.1 Commissioning

Please refer to the commissioning instructions supplied for testo 865s, 868s, 871s, 872s (0973 8723).

4.2 Switching instrument on and off

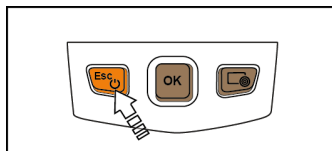
Switching on the camera

- 1 - Remove protective cap from the lens.



- 2 - Press .


- ▶ The camera starts.
- ▶ The start screen appears on the display.

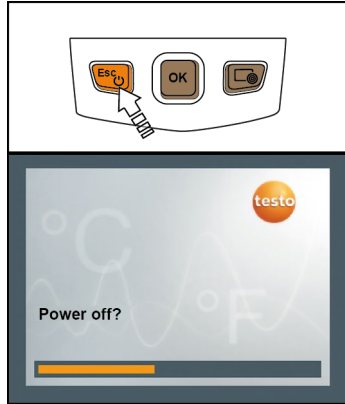


To ensure measuring accuracy, the camera performs automatic zeroing approx. every 60 s. A “click” is heard when this happens. The image freezes briefly when this occurs. Zeroing is carried out more frequently during the camera warm-up period (takes approx. 90 seconds).

During the warm-up period no measuring accuracy is guaranteed. The image can already be used for indication purposes and saved.

Switching off the camera

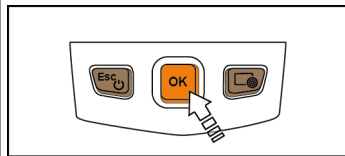
- 1 - Press and hold down  until the progress bar is complete.



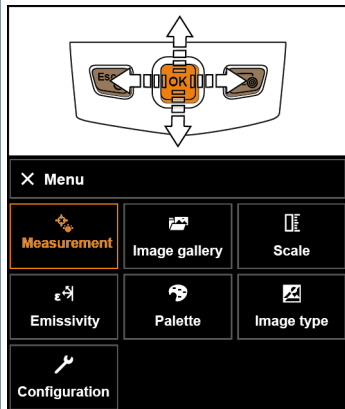
- ▶ The display goes off.
- ▶ The camera is switched off.

4.3 Getting to know the menu

- 1 - Press **OK** to open the **Menu**.



- 2 - Move the joystick to highlight a function (orange border).









- 3 - Press **OK** to select the function.

- 3.1 | - Return to the main menu: Select **Menu** and move the joystick to the left or press **Esc**.

4.4 Quick select button

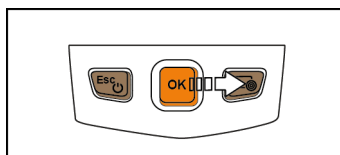
The quick select button is another navigation option that you can use to call up certain functions simply at the touch of a button.

Quick select menu items

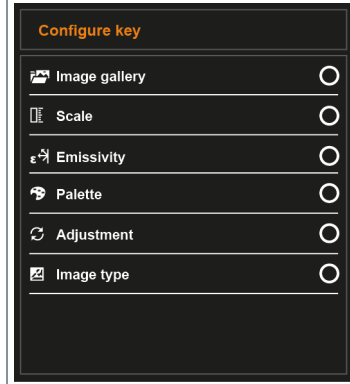
| Menu item | Function |
|--|---|
|  Image gallery | Opens an overview of saved images. |
|  Scale This function is only available if the Image type is set to infrared | Set scale limits. |
|  Emissivity This function is only available if the Image type is set to infrared | Set emissivity (E) and reflected temperature (RTC). |
|  Palette | Toggles the palette selection. |
|  Adjustment This function is only available if the Image type is set to infrared | Carries out manual zeroing. |
|  Image type | Alternately switches the image display between infrared and real image. |

Changing assignment of quick select button


- 1 | - Move the joystick to the right.
- ▶ The **Configure key** selection menu appears.
 - ▶ The activated function is marked with a dot (●).

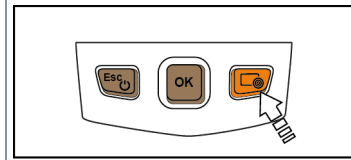


- 2 - Move the joystick up/down until the orange box appears around the required menu item.
 - Press **OK**.
- ▶ The quick select button is assigned to the selected menu item.
- ▶ The icon for the selected function is displayed bottom right.



Using the quick select button

- 1 - Press .
- ▶ The function assigned to the quick select button is carried out.



5 WLAN connection - using the App

5.1 Activating/disabling the connection



To connect via WLAN, you need a tablet or smartphone with the **testo Thermography App** already installed on it.

You can get the App from the App Store for iOS devices or from the Play Store for Android devices.

Compatibility:

Requires iOS 8.3 or later / Android 4.3 or later.

- 1 - Open **Menu**.
- 2 - Select **Configuration**.
 - ▶ The **Configuration** menu opens.
- 3 - Select **Connectivity**.
- 4 - Select **WLAN**.
 - ▶ When connecting for the first time, you will be asked for a password. This is "thermography" by default.
 - ▶ A check mark appears when **WLAN** is enabled.



While WLAN is activated, the image gallery cannot be accessed.

Explanation of WLAN icons

| Symbol | Function |
|--------|--------------------------|
| | App is connected |
| | No connection to the App |

5.2 Using the App

5.2.1 Establishing a connection

- ✓ **WLAN** is enabled in the thermal imager.
- 1 - Smartphone/tablet → **Settings** → **WLAN settings** → camera is shown with serial number and can be selected.

2 | - Press **Connect**.

▶ | The WLAN connection to the thermal imager is established.

5.2.2 Select display

Second display

✓ | The WLAN connection to the thermal imager is established.

1 | - **Selection** → **2nd display**.

▶ | The display on the thermal imager is shown on your mobile end device.

Remote

✓ | The WLAN connection to the thermal imager is established.

1 | - **Selection** → **Remote**.

▶ | The display on the thermal imager is shown on your mobile end device. The thermal imager can be controlled and settings made via the mobile terminal device.

Gallery

✓ | The WLAN connection to the thermal imager is established.

1 | - **Selection** → **Gallery**.

▶ | The saved images are displayed and can be managed.

6 Bluetooth® connection

A connection between the thermal imager and the testo 605i humidity probe or testo 770-3 clamp meter can be established via Bluetooth®.



Bluetooth® 4.0 required

- 1 - Open **Menu**.
- 2 - Move the **joystick** and select **Configuration**.
- Press **OK**.
- 3 - Move the **joystick** down and select **Connectivity**.
- Press **OK**.
- 4 - Select **Bluetooth®** and press **OK** to enable (a check mark appears when **Bluetooth®** is enabled).

Explanation of Bluetooth® icons

| Symbol | Function |
|--------|---------------------------------------|
| | No connection to the probe |
| | Searching for probe. |
| | Probe readings are being transmitted. |



Before a value can be displayed, the corresponding measurement setting for clamp meter or humidity probe must be selected.

When connected to the clamp meter

- ▶ Clamp meter readings are displayed in the header.



Readings are only transferred if the current, voltage or power is set on the clamp meter.

When connected to the humidity probe

- ▶ The thermal imager switches automatically to humidity measurement.



If a WLAN connection is enabled in addition, the Bluetooth data transfer is continued. However, it is not possible to establish a new connection to a probe.

7 Performing the measurement

CAUTION

**High thermal radiation (e.g. due to sun, fire, furnaces)
Detector may be damaged!**

- Do not point the camera at objects with temperatures > 650 °C.

Ideal framework conditions

- Building thermography, investigating the building shell:
Considerable temperature difference between inside and outside required (ideal: $\geq 15\text{ °C}$ / $\geq 27\text{ °F}$).
- Consistent weather conditions, no intensive sunlight, no precipitation, no strong wind.
- To ensure maximum accuracy, the camera requires an adjustment time of 10 minutes after it is switched on.

Important camera settings

- Emissivity and reflected temperature must be set correctly in order to precisely determine the temperature. Subsequent adjustment is possible via the PC software, if required.
- When auto-scaling is activated, the colour scale is continuously adjusted to the min./max. values of the current measurement image. This means that the colour assigned to a specific temperature is changing constantly! To be able to compare multiple images based on the assigned colour, scaling must be set manually to fixed values, or must be subsequently adjusted to uniform values using the PC software.

7.1 Setting measuring functions

- 1 - Open the **Measurement settings** submenu.
 - ▶ The submenu with the measurement settings opens:
 - **Pixel mark:**
 - **Center spot:** the temperature measuring point in the centre of the image is marked with white crosshairs and the value is displayed.
 - **Coldspot, Hotspot:** the lowest or highest temperature measuring point is marked with blue or red crosshairs and the value is displayed.
 - **Show all:** All measuring points are displayed.
 - **Measuring range:** choose between two temperature ranges or **AutoRange**.
 - **Differential temperature:** identifies the difference between two temperatures.
 - **External values:** select **Humidity, Current, Voltage, Solar, Power, None**.
 - **IFOV:** the IFOV warmer shows what can be measured accurately from a specific distance.
- 2 - Move the **joystick** up/down to select the required function and then press **OK**.

7.1.1 Activating/disabling Pixel mark

- 1 - Open **Menu**.
- 2 - Select **Measurement settings**.
 - ▶ The **Measurement settings** menu opens.
- 3 - Select **Pixel mark**.
- 4 - Select **Center spot** and press **OK** to enable (✓) or disable the function.
 - Select **Hotspot / Coldspot** and press **OK** to enable (✓) or disable the function.
 - Select **Show all** and press **OK** to activate all ranges.

7.1.2 Activating the differential temperature

Differential temperature enables the temperatures between two measuring points to be calculated.

- 1 - Open **Menu**.
- 2 - Select **Measurement settings**.
 - ▶ The **Measurement settings** menu opens.
- 3 - Select **Differential temperature** and press **OK**.
- 4 - Select **Active** and press **OK**.
- 5 - Select which differential temperature is to be calculated (P A vs. P B, P A vs. Probe, P A vs. Value, P A vs. RTC).
 - 5.1 - P A vs. P B selection:
 - Move the **joystick** to the right → select measuring point **1** → press **OK** → move the measuring point to the live image using the **joystick** → press **OK**.
 - Move the **joystick** to the right → select measuring point **2** → press **OK** → move the measuring point to the live image using the **joystick** → press **OK**.
 - 5.2 - P A vs. Probe selection:
 - Move the **joystick** to the right → select measuring point **1** → press **OK** → move the measuring point to the live image using the **joystick** → press **OK**.
 - 5.3 - P A vs. Value selection:
 - Move the **joystick** to the right → select measuring point **1** → press **OK** → move the measuring point to the live image using the **joystick** → press **OK**.
 - Move the **joystick** to the right, set the value manually.
 - 5.4 - P A vs. RTC selection:
 - Move the **joystick** to the right → select measuring point **1** → press **OK** → move the measuring point to the live image using the **joystick** → press **OK**.
 - Move the **joystick** to the right, set the RTC value in the **Emissivity** menu, see the section "Setting RTC".
- ▶ The differential temperature is shown in the top centre of the display.

- 6 - End measurement: Select **Active** and press **OK** (no check mark).

7.1.3 Activating external values

- 1 - Open **Menu**.
- 2 - Select **Measurement settings**.
 - ▶ The **Measurement settings** menu opens.
- 3 - Select **External values** and press **OK**.
- 4 - Activate **humidity, current, voltage, solar or power**.



If no **radio probe** is connected, **values** must be entered manually.

If a **radio probe** is connected, **values** are transferred automatically.

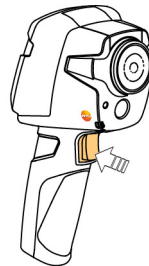
- 5 - Select **✓** and press **OK**.



Values for current, voltage and power can be transferred from the testo 770-3 clamp meter.

7.2 Saving an image

- 1 - Press **Trigger**.
 - ▶ The image is automatically saved.
 - ▶ An infrared image is saved with a real image attached.

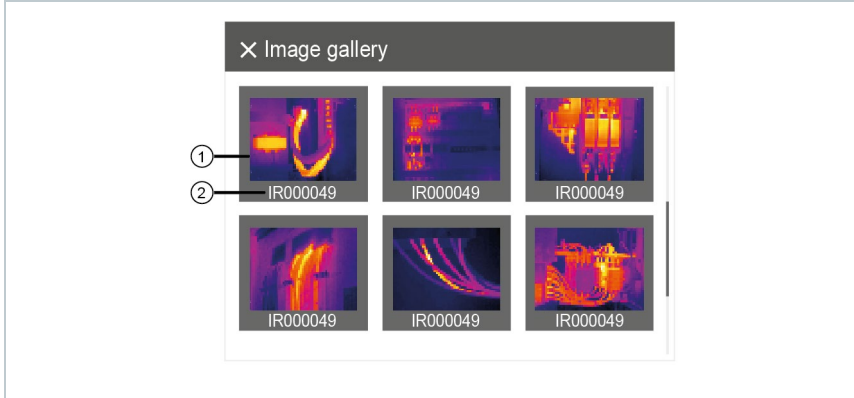


If a higher resolution is required: in the menu, select **Configuration** → **SuperResolution** for four times as many readings.

7.3 Image gallery

Saved images can be displayed, analysed or deleted.

File names



| | Designation | Explanation |
|---|--------------------|---|
| 1 | - | Infrared image preview |
| 2 | IR 000000 SR | Infrared image with attached real image Consecutive number Images captured with SuperResolution |



File names can be changed via the PC, e.g. in Windows Explorer.

Displaying a saved image

Saved images can be viewed and analyzed in the image gallery.

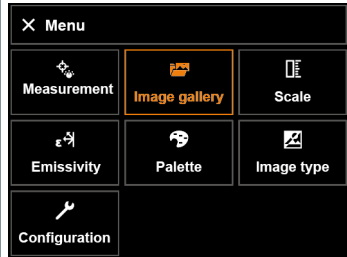


When SuperResolution is enabled, 2 images are saved in the image gallery (an **IR** image, and an **SR** image). The high-resolution SuperResolution image is saved in the background. In the status bar, the number of SuperResolution images to be saved is displayed (for example: **SR(1)**). A maximum 5 SuperResolution images can be processed simultaneously.

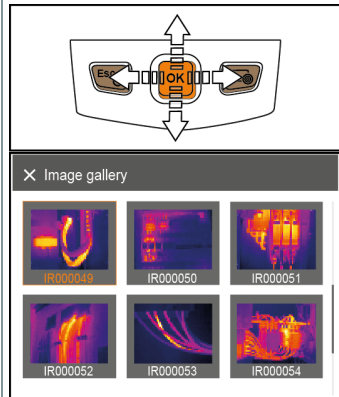
- | | |
|---|---|
| 1 | - Select Image gallery function. |
|---|---|

7 Performing the measurement

- ▶ All saved images are displayed in the form of an infrared image preview.



- 2 - Move **joystick** to select an image.



- 3 - Press **OK** to open the selected image.
- ▶ The image is displayed.

Analyzing an image



If an image is saved with SuperResolution, the image gallery contains an (IR) image and a high-resolution image (SR). The images show the same image section. They can be displayed and analyzed in the image gallery.

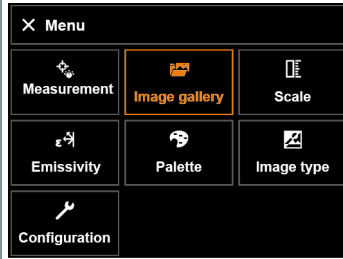
The measurement functions **Center spot**, **Hotspot**, **Coldspot** and **Differential temperature** can be used to analyze saved images. In saved images the crosshairs, which mark the measuring point, can be moved using the joystick.

For a description of the individual functions, please read the information in the relevant sections.

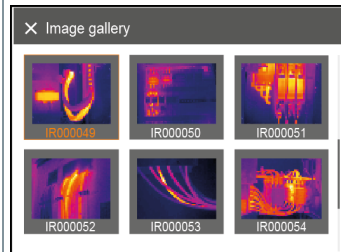
Delete image

- 1 - Select **Image gallery** function.

- ▶ All saved images are displayed in the form of an infrared image preview.

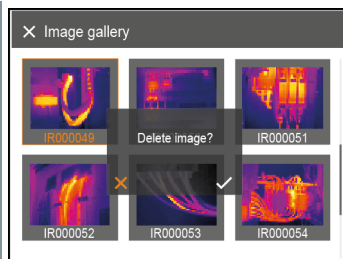


- 2 - Move joystick to select an image.



- 3 - Press .

- ▶ Delete image? is displayed.



- 4 - Press **OK** to delete the image.

- 4.1 - Press **Esc** to cancel the process.

7.4 Setting the scale

Manual scaling can be activated instead of automatic scaling (continuous automatic adjustment to the current min./max. values). The scale limits can be set within the measurement range.

The activated mode is displayed bottom right: **A** automatic scaling, **M** manual scaling and **S** OptiScale (ScaleAssist).



Auto-scaling continuously adjusts the scale to the readings presented, and the colour assigned to a temperature value changes.

In manual scaling fixed limit values are defined, and the colour assigned to a temperature value is fixed (important for visual image

comparisons).

Scaling influences the way the infrared image is shown on the display but does not affect the recorded measuring values.

With ScaleAssist, a standardized scale is set depending on the inside and outside temperature.

Setting automatic scaling

- 1 - Select the Scale function.
 - 2 - Move the joystick up/down until Auto is selected.
 - 3 - Select ✓ and press OK.
- ▶ Automatic scaling is activated. **A** is displayed bottom right.

Setting manual scaling

The lower limit value, the temperature range (upper and lower limit value simultaneously) and the upper limit value can be set.

- 1 - Select the **Scale** function.
 - 2 - Press **OK**.
 - 3 - In the mode menu, move the **joystick** up/down until **Manual** is selected.
 - 4 - Move the **joystick** to the right, select **Min. Temp.** (lower limit value).
- Move the **joystick** up/down to set the values.
 - 5 - Move the **joystick** to the right, select **Max. Temp.** (upper limit value).
- Move the **joystick** up/down to set the value.
 - 5.1 - If necessary, Select **X** and press **OK** to go back to the mode menu.
 - 6 - Select ✓ and press **OK**.
- ▶ Manual scaling is activated. **M** is displayed bottom right.

Setting ScaleAssist

The ScaleAssist function calculates a display-neutral scale depending on the inside and outside temperature. This scale graduation can be used to detect structural defects in buildings.

- 1 | - Select the **Scale** function.
 - 2 | - Press **OK**.
 - 3 | - In the mode menu, move the **joystick** up/down until **ScaleAssist** is selected.
 - 4 | - Move the **joystick** to the right, select **Temp. In** (indoor temperature).
- Move the **joystick** up/down to set the value.
 - 5 | - Move the **joystick** to the right, select **Temp. Out** (outdoor temperature).
- Move the **joystick** up/down to set the value.
 - 5 | - If necessary, Select **X**, press **OK** to **go back to the mode menu**.
 - 7 | - Activate **ScaleAssist**: Select **✓** and press **OK**.
- ▶ Manual scaling is activated. **S** is displayed at bottom right.

7.5 Setting emissivity and reflected temperature

This function is only available if the **image type** is set to infrared image.

You can choose between user-defined emissivity and 8 materials with permanently set emissivity. The reflected temperature (RTC) can be set individually.



Other materials can be imported into the instrument from an existing list using the PC software.

Emissivity information:

The emissivity describes the capability of a body to emit electromagnetic radiation. This is material-specific and must be adapted for correct measurement results.

Non-metals (paper, ceramic, gypsum, wood, paints and coatings), plastics and food have high emissivity, which means that the surface temperature can be easily measured using infrared.

Because of their low or non-uniform emissivity, bright metals and metal oxides only have limited suitability for infrared measurement. Highly inaccurate measurements should be expected. A remedy for this is coatings that increase

7 Performing the measurement

emissivity, e.g. paint or emission adhesive (accessory: 0554 0051), which must be applied to the object to be measured.

The following table gives typical emissivities of important materials. These values can be used as a guide for user-defined settings.

| Material (material temperature) | Emissivity |
|--------------------------------------|------------|
| Aluminium, bright rolled (170 °C) | 0.04 |
| Cotton (20 °C) | 0.77 |
| Concrete (25 °C) | 0.93 |
| Ice, smooth (0 °C) | 0.97 |
| Iron, emery-ground (20 °C) | 0.24 |
| Iron with casting skin (100 °C) | 0.80 |
| Iron with rolling skin (20 °C) | 0.77 |
| Gypsum (20 °C) | 0.90 |
| Glass (90 °C) | 0.94 |
| Rubber, hard (23 °C) | 0.94 |
| Rubber, soft grey (23 °C) | 0.89 |
| Wood (70 °C) | 0.94 |
| Cork (20 °C) | 0.70 |
| Radiator, black anodised (50 °C) | 0.98 |
| Copper, slightly tarnished (20 °C) | 0.04 |
| Copper, oxidised (130 °C) | 0.76 |
| Plastics: PE, PP, PVC (20 °C) | 0.94 |
| Brass, oxidised (200 °C) | 0.61 |
| Paper (20 °C) | 0.97 |
| Porcelain (20 °C) | 0.92 |
| Black paint, matt (80 °C) | 0.97 |
| Steel, heat-treated surface (200 °C) | 0.52 |
| Steel, oxidised (200 °C) | 0.79 |
| Clay, burnt (70 °C) | 0.91 |
| Transformer paint (70 °C) | 0.94 |
| Brick, mortar, plaster (20 °C) | 0.93 |

Reflected temperature information:

Using this offset factor, the reflection is calculated out based on the low emissivity, and the accuracy of the temperature measurement with infrared measuring instruments is improved. In most cases, the reflected temperature is identical to the ambient air temperature. Only when objects with strong emissions at much lower temperatures (such as cloudless skies during outdoor readings) or much higher temperatures (such as ovens or machines) are in proximity to the object being measured should the radiation temperature of

these sources be determined and used. The reflected temperature has little effect on objects with high emissivity.

@ Further information can be found in the Pocket Guide.

7.5.1 Selecting the emissivity

- 1 - Select the **Emissivity** function.
- 2 - Move the **joystick** up/down to select the required substance or material (with fixed emissivity).
- 3 - Select **✓** and press **OK**.

7.5.2 Customizing the emissivity

- 1 - Select the **Emissivity** function.
- 2 - Move the joystick up/down until **User defined** is selected.
- Move the **joystick** to the right until **E** is selected.
- Manually set value.
- 3 - Select **✓** and press **OK**.

7.5.3 Setting RTC

- 1 - Select the **Emissivity** function.
- 2 - Move the joystick to the right until **RTC** is selected.
- Manually set value.
- 3 - Select **✓** and press **OK**.

7.5.4 Setting ϵ -Assist

- 1 - Select the **Emissivity** function.
 - 2 - Move the **joystick** to the right until ϵ -Assist is selected.
 - 3 - Press **OK**.
 - 4 - Affix ϵ -marker to the object and measure with the camera.
- ▶ RTC and emissivity are automatically adjusted.

- 5 - Press **OK**.



If it is not physically possible to determine the emissivity due to the same object temperature and reflected temperature, the input field opens again. The emission value must be input manually.

7.6 Selecting the colour palette

This function is only available if the **Image type** is set to infrared image.

- 1 - Select the Palette function.
- 2 - Move the joystick up/down to select the required colour palette and then press **OK**.

7.7 Image type

The display can be switched between infrared image and real image (digital camera).

- 1 - Select the **Image type** function.
- 2 - Move the **joystick** up or down and choose between infrared image or real image view.
- 3 - Press **OK** to confirm the selection.

7.8 Configuration

7.8.1 Settings

Country settings

The user interface language can be set.

- 1 - Select **Configuration** → **Settings** → **Country settings**.
- 2 - Move the **joystick** up/down to select the required language and then press **OK**.

Set time/date

Time and date can be set. The time and date format are set automatically based on the selected user interface language.

- 1 - Select **Configuration** → **Settings** → **Set time/date**.

- 2 | - Move the **joystick** to the right/left to select the required setting option.
- 3 | - Move the **joystick** up/down to set the value.
- 4 | - After setting all values, select **✓** and press **OK**.

Temperature unit

The temperature unit can be set.

- 1 | - Select **Configuration** → **Settings** → **Temperature unit**.
- 2 | - Move the **joystick** up/down to select the required unit and then press **OK**.

Power-save options

The illumination intensity of the display can be set. A lower intensity increases the battery life.

The time until automatic switch-off can be set.

- 1 | - Select **Configuration** → **Settings** → **Power-save options**.
- 2 | - Move the **joystick** up/down to select the required intensity level and then press **OK**.

7.8.2 SuperResolution

SuperResolution is a technology to improve image quality. For each shot a sequence of images is saved in the thermal imager. Using the camera, App, or PC software, an image is recorded with four times more measurement values (no interpolation). The geometric resolution (IFOV) is improved by a factor of 1.6.

To use the function, the following conditions must be fulfilled:

- The camera is hand-held.
 - The objects to be imaged do not move.
- 1 | - Select **Menu** → **Configuration** → **SuperResolution**.
 - 2 | - Press **OK** to enable or disable the function.

7.8.3 Save JPEG

Infrared images are saved in BMT (image with all temperature data) format. The image can also be saved in JPEG format (without temperature data) at the same time. The image content corresponds to the infrared image shown on the display, including scale display and image marks for the selected measuring

functions. The JPEG file is saved under the same file name as the associated BMT file and can be opened on the PC, even without using the IRSof PC software.

- 1 - Select **Menu** → **Configuration** → **Save JPEG**.
- 2 - Press **OK**.
- 3 - Move the **joystick** up/down until **On/Off** is selected.
- 4 - Add a date/time stamp to a JPEG file if required. Turn function on or off for this.
- 5 - Select **✓** and press **OK**.

7.8.4 Connectivity

Enable/disable WLAN or Bluetooth®

- 1 - Select **Menu** → **Configuration** → **Connectivity**.
- 2 - Move the **joystick** to the right (>).
 - Select **WLAN** and press **OK** to enable (**✓**) or disable the function.
 - Select **Bluetooth** and press **OK** to enable (**✓**) or disable the function.
- 3 - Press **Esc** to cancel the process.



If there is an active Bluetooth connection and a WLAN connection is activated in addition, the Bluetooth data transfer is continued. However, it is not possible to establish a new connection to a humidity probe.

7.8.5 Configure key

- 1 | Select **Menu** → **Configuration** → **Configure key**.
- 2 | See the section “Quick select button”.

7.8.6 Ambient conditions

Measurement deviations arising due to high humidity or large distances to the object to be measured can be corrected. Correction parameters must be entered for this.

If the camera is connected to an optional humidity radio probe, the ambient temperature and humidity are transferred automatically.

Values for ambient temperature (Temperature) and ambient humidity (Humidity) can be set manually.

- 1 - Select **Menu** → **Configuration** → **Ambient conditions**.
- 2 - Move the **joystick** up/down to set the temperature value.
- 3 - Move the **joystick** to the right.
- 4 - Move the **joystick** up/down to set the humidity value.
- 5 - Select **✓** and press **OK**.

7.8.7 Info

- 1 - Select **Menu** → **Configuration** → **Info**.
 - ▶ The following instrument information is displayed:
 - Device data (e.g. serial number, device name, firmware version)
 - Options
 - Measurement settings
 - Connectivity

7.8.8 Certificates

- 1 Select **Menu** → **Configuration** → **Certificates**.
 - ▶ - Displays the radio certificates for the instrument.

7.8.9 Fullscreen mode

The scale and the quick select button function indicator can be hidden.

- 1 - Select **Menu** → **Configuration** → **Fullscreen mode**.
 - ▶ When Fullscreen Mode is activated, the scale and icon for the quick select button are hidden. When a key is pressed, these elements are displayed briefly.

7.8.10 Reset options

Reset image counter



After a reset, the consecutive numbering of images starts again from the beginning. When saving images, already saved images with the same number are overwritten!

Back up all saved images before resetting the counter to prevent possible overwriting.

- 1 - Select **Menu** → **Configuration** → **Reset options**.
- 2 - Select the **Reset image counter** function.
 - ▶ **Reset image counter?** is displayed.
- 3 - Select **✓** and press **OK** to reset the image counter.
- 3.1 - Press **Esc** or select **X** and press **OK** to cancel the process.

Factory settings

The instrument settings can be reset to the factory settings.



Time/date, country settings and image counter are not reset.

- 1 - **Menu** → **Configuration** → **Reset options**.
- 2 - Select the **Factory settings** function.
 - ▶ **Apply factory settings?** is displayed.
- 3 - Select **✓** and press **OK** to reset to factory settings.
- 3.1 - Press **Esc** or select **X** and press **OK** to cancel the process.

Formatting

The image memory can be formatted.



When formatting, all data saved in the memory is lost.

Back up all saved images before formatting to prevent loss of data.

Formatting does not reset the image counter.

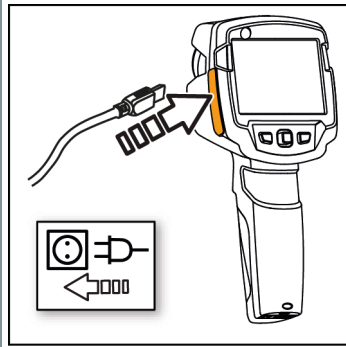
- 1 - **Menu** → **Configuration** → **Reset options**.

- 2 - Select the **Format** function.
- ▶ **Format memory?** is displayed.
- 3 - Select **✓** and press **OK** to format the memory.
- 3.1 - Press **Esc** or select **X** and press **OK** to cancel the process.

8 Maintenance

8.1 Charging the rechargeable battery

- 1 - Open the cover of the interface terminal.



- 2 - Connect the recharger cable to the Micro-USB interface.
 - 3 - Connect the mains unit to a mains socket.
- ▶ The charging process starts.
If the battery has been completely drained, the charging time is approx. 5 hours.
 - ▶ Whether the battery is full or charging is indicated.

8.2 Changing the rechargeable battery

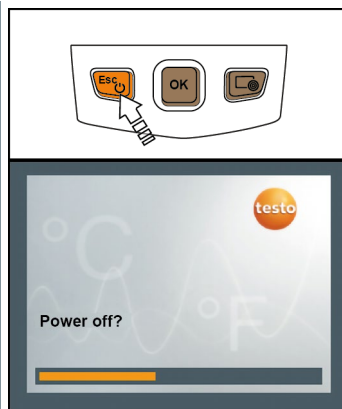
⚠ WARNING

Serious risk of injury to the user and/or destruction of the instrument

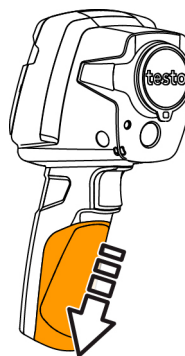
> There is a risk of explosion if the battery is replaced with one that is the wrong type.

> Dispose of spent/faulty batteries in accordance with the relevant legal specifications.

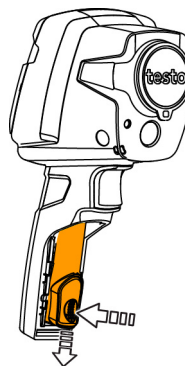
- 1 - Switch the instrument off.



- 2 - Open battery compartment.



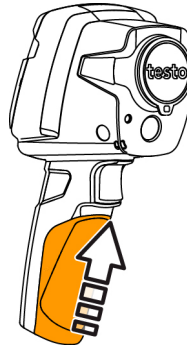
- 3 - Release the battery and remove.



- 4 - Insert new battery and slide upwards until it clicks into place.



- 5 - Close the battery compartment.



8.3 Cleaning the instrument

Cleaning the instrument housing

- ✓ - The interface terminal is closed.
 - The battery compartment is closed.
- 1 - Rub down the surface of the instrument with a damp cloth. Use mild household cleaning agents or soapy water for this.

Cleaning the lens and display

- 1 - If the lens is dirty, clean it with a cotton bud.
- 2 - If the display is dirty, clean it with a cleaning cloth (e.g. microfibre cloth).

8.4 Firmware update

The current firmware version is available at www.testo.com.

There are two options available:

- Performing an update using IRSoft or
- Performing an update with the thermal imager

Downloading firmware

- 1 - Download firmware: **Firmware-testo-865-872.exe**
- 2 - Unzip file: double-click on the exe. file
 - ▶ **FW_T87x_Vx.xx.bin** is stored in the selected folder.

8.4.1 Performing an update using IRSoft

8.4.1.1 Preparing the camera

- ✓ - The rechargeable battery is fully charged or the camera is connected to the mains adapter.
- 1 - Connect the computer to the camera with the USB cable.
 - 2 - Switch on the camera.

8.4.1.2 Performing an update

- ✓ IRSoft is activated.
- 1 - Select **Camera** → **Configuration**.
 - 2 - Click on **Configure thermal imager**.
 - ▶ The **Camera settings** window opens.
 - 3 - Select **Instrument settings** → **Firmware Update** → **OK**.
 - ▶ **FW_T87x_Vx.xx.bin** is displayed.
 - 4 - Select **Open**.
 - ▶ Firmware update is performed.
 - ▶ Thermal imager is automatically restarted. Update complete.



In certain circumstances, the camera reports: **Firmware update finished. Please restart the device.** A restart is not performed.

Action:

- After 10 seconds, switch off the camera; switch back on again after 3 seconds.

▶ The current firmware version is displayed.

8.4.2 Performing an update with the camera

8.4.2.1 Preparing the camera

- ✓ - The rechargeable battery is fully charged or the camera is connected to the mains adapter.
- 1 - Switch on the camera.
- 2 - Open the cover of the interface.
- 3 - Connect the computer to the camera with the USB cable.
 - ▶ The camera is displayed as **MTP Device - testo_8xx** in Window Explorer.

8.4.2.2 Performing an update

- 1 - Copy the **FW_T87x_Vx.xx.bin**- file to the camera directory using drag & drop.
- 2 - Wait until the firmware has been copied.
 - ▶ Firmware update is performed.
- 3 - Observe the progress bar.
 - ▶ Thermal imager is automatically restarted. Update complete.

9 Tips and assistance

9.1 Questions and answers

| Question | Possible cause / solution |
|--|---|
| Error! Memory full! is displayed. | Insufficient memory available: Transfer images to the PC or delete. |
| Error! Permissible instrument temperature exceeded! is displayed. | Switch off the camera, allow the instrument to cool down and observe the permissible ambient temperature. |
| ~ is displayed before a value. | Value is outside the measuring range: extended display range with no guarantee of accuracy. |
| --- or +++ is displayed instead of a value. | Value is outside the measuring range and the extended display range. |
| xxx is displayed instead of a value. | Value cannot be calculated: check parameter settings for plausibility. |
| Automatic zeroing (audible "click" and brief image freeze) is carried out very frequently. | Camera is still in its warm-up period (takes approx. 90 seconds): Wait until the warm-up period has passed. |

If we have not been able to answer your question, please contact your dealer or Testo Customer Service. You will find contact details on the back of this document or on the website www.testo.com/service-contact.

9.2 Accessories and spare parts

| Description | Order no. |
|---|-----------|
| Battery charging station 5 V, 2 A | 0554 1103 |
| Spare rechargeable battery | 0554 8721 |
| Additional markers for ϵ -Assist function (10 off) | 0554 0872 |
| Emission tape | 0554 0051 |
| ISO calibration certificate: calibration points at 0°C, 25°C, 50°C | 0520 0489 |
| ISO calibration certificate: calibration points at 0°C, 100°C, 200°C | 0520 0490 |
| ISO calibration certificate: Freely selectable calibration points in the range -18 °C to 250 °C | 0520 0495 |

For further accessories and spare parts, please refer to the product catalogues and brochures or look up at www.testo.com.

10 Authorisations and certification

Please refer to the commissioning instructions supplied for testo 865s, 868s, 871s, 872s (0973 8723).



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