

BENNING

Operating manual

Translation of the German original version



BENNING TC 30

5306 / 12/2023 en

Legal notice

Notes concerning the documentation

Ensure that the applicable documentation is used for this product. For safe handling, knowledge that is provided in these instructions is required.

The product may only be handled while following this documentation, particularly the safety instructions and warnings it contains. The personnel must be qualified for the respective task and have the capability to recognise risks and prevent possible dangers.

Manufacturer and holder of rights

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Disclaimer

The contents of the documentation has been checked to ensure that it corresponds to the hardware and software described. Nevertheless, deviations cannot be ruled out, so Benning cannot guarantee complete correspondence. The contents of this documentation are checked at regular intervals, and any corrections that are needed are contained in the versions that follow.

General non-discrimination

Benning is aware of the importance of language with regard to the gender equality and endeavors to take this into account at all times. To improve readability, we have refrained from consistently using differentiating formulations.

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1 Introduction

The BENNING TC 30 thermal imaging camera described here (in the following only referred to as “device”) is intended for making thermal images, optical images and video recordings. The device determines the surface temperature of an object by measuring the IR radiation (infrared radiation) emitted by the object. The integrated infrared detector of the device determines the intensity of the IR radiation and makes it visible to the human eye as a thermal image.

The temperature measuring range of the device is between -20 °C and +400 °C with an accuracy of ± 2 % of the measured value or 2 °C at an ambient temperature between +15 °C and +35 °C and an object temperature of more than 0 °C.

Further information



<https://tms.benning.de/tc30>

On the Internet, you will find the following additional information directly at the specified link or at www.benning.de (product search):

- Operating manual of the device in several languages
- Further information depending on the device (e. g. brochures, technical reports, FAQs)

1.1 General notes

Target group

This operating manual is intended for the following groups of people:

- Professional users, craftspeople and do-it-yourselfers

Required basic knowledge

To understand these operating manual, you will need general knowledge of testing and measuring equipment. Moreover, you will need basic knowledge of the following issues:

- Thermography

Purpose of the operating manual

This operating manual describes the device and provides you information about how to handle it.

Keep this operating manual in a safe place for later use. Read this operating manual before handling the device and follow the instructions.

NOTE

Disclaimer of liability

Please make sure that any person using the device has read and understood the instructions of this operating manual before handling the device and that the instructions are adhered to in all points. Non-observance of this operating manual might result in product damage, property damage and/or personal injury.

Benning assumes no liability for damage and malfunctions resulting from the failure to observe the instructions in this operating manual.

The devices are subject to continuous further development. Benning reserves the right to make changes to the device's design, configuration and technology. The information in this operating manual corresponds to the state of technical knowledge at the time of printing. For this reason, no claims for certain device characteristics can be derived from the contents of this operating manual.

Information in this operating manual can be changed at any time without prior notice. Benning is not obligated to make amendments to this operating manual or to keep it up to date.

Direct any technical questions to Technical Support [▶ page 8].

Trademarks

All trademarks used are the property of their respective owners, even if they are not separately marked as such.

1.2 History

Release number	Amendments
12/2023	• Initial release

Table 1: History

1.3 Service & support

Please contact your specialty retailer or the BENNING Service Center for any repair or service work that might be required.

Technical Support

Please contact our Technical support for technical questions on handling the device.

Phone:	+49 2871 93-555
Fax:	+49 2871 93-6555
E-Mail:	helpdesk@benning.de
Internet:	www.benning.de

Returns management

Easily and conveniently use the BENNING returns portal for a quick and smooth returns processing:

<https://www.benning.de/service-de/retourenabwicklung.html>

Phone:	+49 2871 93-554
E-Mail:	returns@benning.de

Return address

BENNING Elektrotechnik und Elektronik GmbH & Co. KG

Retourenmanagement

Robert-Bosch-Str. 20

D - 46397 Bocholt

2 Safety

2.1 Warning system

This operating manual contains notes that must be taken into consideration for your personal safety and in order to avoid injuries and damage to property. Warnings about your personal safety and to prevent personal injuries are marked with a warning triangle. Warnings on sole prevention of material damage are shown without a warning triangle. The warnings are shown in descending order depending on the hazard level as follows.

 **DANGER**

Extremely dangerous situation for humans

If you do not pay attention to this warning, irreversible or deadly injuries will occur.



 **DANGER**

Extremely dangerous situation for humans

If you do not pay attention to this warning, irreversible or deadly injuries will occur.

 **WARNING**

Hazard to humans

If you do not pay attention to this warning, irreversible or deadly injuries could occur.



 **WARNING**

Hazard to humans

If you do not pay attention to this warning, irreversible or deadly injuries could occur.

 **CAUTION**

Minor hazard to humans

If you do not pay attention to this warning, minor or moderate injuries could occur.



 **CAUTION**

Minor hazard to humans

If you do not pay attention to this warning, minor or moderate injuries could occur.

NOTICE

Danger to property, not to persons

If you do not pay attention to this warning, material damage could occur.



NOTICE

Danger to property, not to persons

If you do not pay attention to this warning, material damage could occur.

If multiple hazard levels occur, the warning for the highest respective hazard level will be used. In addition, a warning about personal injuries can also include a warning about material damage.

2.2 Symbols used

Symbols on the device






Symbol	Meaning
	Please observe the information provided in this operating manual in order to avoid dangers.
	The device complies with EU directives.
	The device complies with directives applicable in Great Britain.
	At the end of product life, dispose of the unserviceable device via appropriate collecting facilities provided in your community.
	Please observe the operating manual.

Table 2: Symbols on the device

Symbols used in the operating manual



Symbol	Meaning
	General warning
	Warning of electric voltage!

Table 3: Symbols used in the operating manual

2.3 Intended use

Only use the device within the framework of the corresponding technical data. Any operating conditions that deviate from this shall be considered as improper use. Solely the user of the device shall be liable for any resulting damage.

Please note the following:

- In case of improper use, the liability and warranty claims become void. Solely the user of the device shall be liable for any damage resulting from improper use. Uses not complying with the intended use include e. g.:
 - Use of components, accessories, spare or replacement parts that have not been released and approved for the respective application by Benning
 - Non-observance, manipulation, changes or misuse of the operating manual or the instructions and notes contained therein
 - Any form of misuse of the device
 - Any use other than or beyond that described in this operating manual
- Warranty and liability claims are generally excluded if the damage is the result of force majeure.
- If any prescribed services are not performed regularly or not on time, according to the manufacturer's specifications during the warranty period, a decision about a warranty claim can only be made once the findings are available.

Direct any questions to Technical Support [▶ page 8].

Using the device

Please observe the following basic obligations when using the device:

- The device may only be used in a technically perfect and safe condition. Always check the device for damages before using it.
- The personnel must be qualified for the respective task.
- Observe relevant regulations on occupational safety and health as well as those on environmental protection.
- The device may only be used in dry environments.
- Do not use the device in potentially explosive environments.
- Do not use the device in extremely hot, cold, dusty, corrosive, salty, alkaline or humid environments.
- Do not use the device in the vicinity of high levels of electromagnetic radiation.
- Avoid violent impacts or dropping the device.

Securing the device

If the device is not in a technically perfect and operationally safe condition, safe operation is no longer guaranteed. Make sure that the following measures are taken:

- Switch off the device.

The following characteristics indicate that safe operation is no longer guaranteed:

- The device shows visible damage.
- The device does not work properly in compliance with regulations (e. g. errors during measurements).
- The device shows recognisable consequences of prolonged storage under inadmissible conditions.
- The device shows recognisable consequences of extraordinary stress due to transport.

2.4 Standards applied

The device has been built and tested in compliance with the following standards and has left the factory in perfectly safe condition.

- IEC / DIN EN 62368-1 (VDE 0868-1)
- IEC / DIN EN 55032 (VDE 0878-32)
- IEC / DIN EN 55035 (VDE 0878-35)
- IEC / DIN EN 301 489-1

3 Scope of delivery

The scope of delivery of the device includes the following components:

- 1 x BENNING TC 30 thermal imaging camera (item no.: 050530)
- 1 x charger with USB-C connecting cable
- 1 x carrying strap
- 1 x transport and storage case
- 1 x quick reference guide

Software

- PC software “BENNING TC Analyser” [▶ page 19]
- App “BENNING TC-Image Link” [▶ page 19]

Optional accessories

- Macro lens (item no.: 10237623)

4 Device structure



Figure 1: Device description

1	Touch display	2	Flashlight (flash)
3	Thermal lens	4	Optical lens
5	Microphone	6	USB-C port
7	State of charge LED	8	Buzzer (sound output)
9	Wrist strap attachment point	10	Tripod thread
11	Notes and information about the device	12	Shutter button
13	ON/OFF key	-	-

Digital display

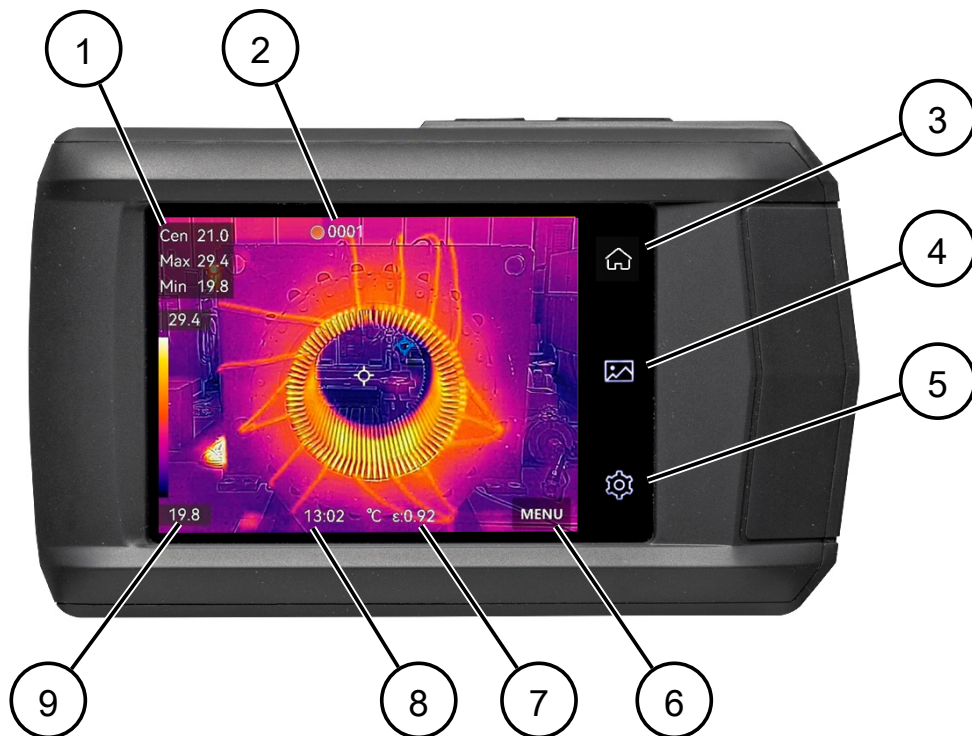


Figure 2: Touch display

1	Temperature measuring points	2	No. of images/videos (scheduled and continuous capture)
3	Camera live view	4	File management
5	Local settings	6	Menu
7	Temperature unit and emissivity	8	Time display
9	Colour scale from min. to max. measured temperature value	-	

5 Functions

Temperature alarm

The device provides a “Temperature Alarm” function [▶ page 23]. You can specify a temperature threshold and link this to an alarm. If the threshold value is exceeded, the device will emit an alarm.

The following alarm functions are available:

- Audible Warning
The device emits an acoustic signal.
- Flashing Alarm
The device activates the flashlight and emits flash signals.

Temperature measuring range

To improve measurement quality, the device offers two temperature measuring ranges:

- 20 ... 150 °C
- 100 ... 400 °C

You can select one of the two measuring ranges or the “Auto Switch” mode [▶ page 23]. In the “Auto Switch” mode, the device automatically recognises the appropriate temperature range.

WLAN and WLAN hotspot

The device supports both a WLAN connection [▶ page 23] and a WLAN hotspot function.

You can connect the device to the WLAN hotspot of a mobile device (smartphone / tablet) or enable the WLAN hotspot on the device itself [▶ page 24] to establish a WLAN connection to a mobile device.

Capture mode

The device provides three different capture modes [▶ page 24]:

- Capture One Image
When the shutter button is pressed, the device captures a single image.
- Scheduled Capture
When the shutter button is pressed, the device continuously captures images depending on a time interval. The time interval can be set from 1 to 60 seconds. During capturing, a counter at the top of the screen shows the number of images captured.
- Continuous Capture
When the release button is pressed, the device continuously captures images depending on the number of images set. The number of images can be set from 2 to 9 images. During capturing, a counter at the top of the screen shows the number of images captured.

Emissivity

The emissivity describes the ability of a body to emit electromagnetic radiation (heat radiation) compared to an ideal thermal radiator – a so-called black body. Thus, the value is always between 0 and 1.

The emissivity depends on the material (material-specific) and must be adjusted for correct measuring results [▶ page 23].

Non-metals generally have a high emissivity (> 0.9) and provide good temperature measuring results.

The suitability of shiny surfaces, bare metals and metal oxides for infrared measurement is only limited, as they have a low emissivity and thus emit only a low level of heat radiation. Even if the emissivity is set correctly for these materials, a lower measuring inaccuracy must be assumed.

The device provides the following material-specific emissivities:

Material	Emissivity
Human skin	0.98
Printed circuit board (PCB)	0.91
Cement concrete	0.95
Ceramics	0.92
Rubber	0.95
Paint	0.93
Wood	0.85
Resin	0.96
Brick	0.95
Sand	0.90
Soil	0.92
Cotton	0.98
Cardboard	0.90
White paper	0.90
Water	0.96

Table 4: Material-specific emissivity

Self-calibration

The device carries out a self-calibration at regular intervals to optimise image quality and measuring accuracy. During this process, the image pauses briefly and you will hear a “click” when the shutter of the detector moves. Self-calibration occurs more frequently during the start-up process or in very cold or hot environments and is indicated by the prompt “Calibrating ...” on the screen.

Data transfer and data backup

You can transfer stored image and video files to a PC [▶ page 30].

Macro mode

You can use the macro mode to view and better focus on very small objects [▶ page 31]. To do this, you will need the macro lens [▶ page 14].

Screen casting

You can use an external software application based on the UVC protocol (e. g. camera app under MS Windows®) to cast the device screen live to your PC screen [► page 31].

BENNING TC Analyser

You can analyse and document the data stored on the device using the “BENNING TC Analyser” PC software.

You can download the “BENNING TC Analyser” PC software at <http://tms.benning.de/tc30> and install it on your PC. Start the programme and read the integrated operating instructions to become familiar with the application.

BENNING TC-Image Link

You can transfer the data stored on the device and the camera live view to a mobile device (smartphone, tablet) using the “BENNING TC-Image Link” app.

You can download the app from the Apple App Store or the Google Play Store and install it on your end device. Start the app and read the integrated operating instructions to become familiar with the application.

6 Getting started

6.1 Charging the battery

Charge the integrated lithium-ion battery completely before using the device for the first time. Only use the mains adapter included in the scope of delivery to charge the integrated battery (item no.: 10237620).

Make sure that there is no flammable material within 2 metres of the charger during the charging process.

The charging time is about 3 hours.

States of charge:

- LED lights red: Charging process active
- LED flashing red: Error while charging
- LED lights green: Charging process completed

6.2 Switching the device ON/OFF

To switch the device on or off, press the ON/OFF key for approx. 3 seconds. The device is ready for use after 30 seconds.

6.3 Setting the language

By default, English is selected in the factory settings. You can change the language for the device under the following path:

Menu

“Local Settings” > “Device Settings” > “Language”

“Lokale Einstellungen” > “Geräteeinstellungen” > “Sprache” [▶ page 25]

6.4 Auto power-off (APO)

Menu

“Settings” > “Device settings” > “Auto Power-off”

In the factory settings, the automatic power-off is disabled (“OFF”).

You can set a time-dependent, automatic power-off of the device. If you do not use the device during the set switch-off time (10 to 60 minutes), the device switches off automatically.

5 seconds before power-off, the message “About to shutdown” is displayed. You can stop the switch-off process by tapping “Cancel”.

6.5 General operation

The device has three menus:

- Swipe-down menu [▶ page 22]
- Local settings [▶ page 23]
- Menu [▶ page 26]

In the menus, the following buttons (symbols) are available for operation:

Local settings






Symbol	Meaning and operation
	You can exit the menu. The settings made will be saved.
	You can open the submenu.
	You can disable/enable parameters. If the button is highlighted in blue, the parameter is enabled.
	Confirm the entry.
	You can disable/enable parameters. If the slider is highlighted in blue, the parameter is enabled.

Table 5: General operation of the “Local Settings” menu

Menu

Configuring the camera live view



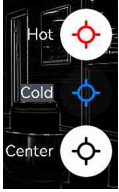
Symbol	Meaning and operation
	Exit the menu, save settings.
	Confirm the entry.
	You can disable/enable parameters. If the symbol is highlighted in white, the parameter is enabled.

Table 6: General operation of the menu

7 Settings

7.1 Swipe-down menu

The swipe-down menu is intended for quickly enabling/disabling functions and setting the display.

You can open the swipe-down menu by swiping down from the top edge of the display. If a function is highlighted in white, it is active.

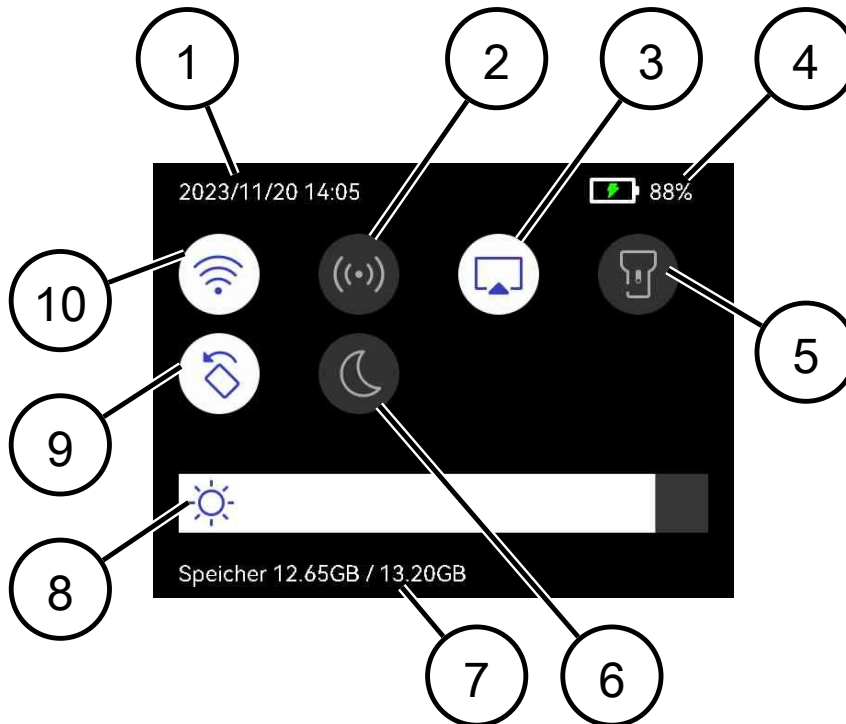


Figure 3: Swipe-down menu

1	Date and time	2	WLAN hotspot
3	Screen casting	4	Battery status
5	Flashlight	6	Light/dark mode of the display
7	Memory status	8	Screen brightness
9	Auto-rotate	10	WLAN

7.2 Local settings

The “Local Settings” menu is intended to edit the basic settings of the device. You can make the following settings:

7.2.1 Measurement settings

Make the following measurement settings to achieve the best possible measuring result:

Menu

“Local Settings” > “Measurement Settings”

Setting	Meaning and operation
Temperature Range	Select a corresponding temperature measuring range or the “Auto Switch” mode.
Emissivity	Select the emissivity of the target object [▶ page 18]. You can choose from the given material-specific emissivities) or specify a custom emissivity.
Ref. Temp.	Set the ambient temperature. If there are radiating objects with a much higher temperature in the vicinity of the target object (with low emissivity), use the temperature of the radiating object.
Humidity	Set the current air humidity of the environment.
Alarm Settings	You can enable the temperature alarm [▶ page 17]. Select a temperature threshold and the alarm linkage.

Table 7: Measurement settings

7.2.2 Connections

7.2.2.1 Establishing a connection via WLAN

Menu

“Local Settings” > “Connections” > “WLAN”

Procedure

1. Enable the “WLAN” function on the device. To do this, open the menu and tap the slider.
The available WLAN networks are displayed.
2. Select a WLAN network to which you want to connect.
3. Enter the password of the WLAN network.
4. Confirm your entry.

The password is saved and a WLAN connection is established. If the WLAN connection is established, a blue “tick” symbol will be displayed in front of the network name.

7.2.2.2 Enabling a WLAN hotspot

Menu

“Local Settings” > “Connections” > “Hotspot”

Procedure

1. Enable the “Hotspot” function on the device. To do this, open the menu and tap the slider.
The name of the WLAN hotspot is displayed and consists of the last 9 digits of the device's serial number.
2. Replace the default hotspot password with a customised password. To do this, tap “Set Hotspot”.
3. Delete the preset password. To do this, tap the “x” symbol.
4. Now enter the individual password and confirm the entry.
The new password must contain at least 8 digits and can consist of numbers and letters. Do not use spaces or special characters.
5. Open the WLAN settings of your mobile device to connect to the WLAN hotspot of the device.

7.2.3 Display settings

Menu

“Local Settings” > “Display Settings”

Setting	Meaning
Time	You can enable the time display to show the set time [▶ page 25] on the display of the device.
Parameters	You can enable the parameters to show the emissivity and the temperature unit on the display of the device.

Table 8: Display settings

7.2.4 Camera settings

Menu

“Local Settings” > “Capture Settings”

Setting	Meaning and operation
Capture Mode	Select the one of the capture modes “Capture One Image”, “Scheduled Capture” or “Continuous Capture” [▶ page 17].
Visual Image Resolution	Select the desired visual image resolution (2.5 or 8 MP).

7.2 Local settings

Setting	Meaning and operation
Filename Header	You can enter the file name (2 to 7 characters) under which the image or video recording is to be saved. The file name will be automatically supplemented with the set date and time of the device. Example: Name20231015112041.jpeg (name/year/month/day/hours/minutes/seconds)
Macro Mode	To capture very small objects, set the macro mode and attach the optional macro lens [▶ page 31].
Save Visual Image	You can enable this function to save a separate visual image in addition to the thermal image.
Edit before Saving	You can enable this function if you want to add a comment (information text) before saving the image.

Table 9: Camera settings

7.2.5 Device settings

Menu

“Local Settings” > “Device Settings”

Setting	Meaning and operation
Screen Brightness	You can adjust the screen brightness using the slider.
Unit	Set the desired unit for temperature (°C / °F / Kelvin) and distance (m / feet).
Language	You can select one of the available languages.
Time and Date	Set the time and date of the device.
Auto-Rotate	You can enable the automatic rotation of the On-Screen Display (OSD). This is also possible via the swipe-down menu.
Auto Power-off	You can enable the automatic power-off (APO) of the device (OFF, 10 to 60 minutes).
Device Initialization	Format Storage: You can format the memory. The device formats the internal memory and deletes all existing data. Restore Device: You can reset the device to the factory settings. You will be prompted for confirmation before executing the functions.
Device Information	Here, the following information about the device is stored: model, version, module, serial number and IP address.

Table 10: Device settings

7.3 Menu – Configuring the camera live view

Configure the camera live view to achieve the best possible measuring result. To do this, open the menu.

Procedure

Select a setting (Measurement, Image Mode, Palettes or Level & Span). Tap the desired configuration. It will be highlighted in colour after selection. Exit the menu by tapping “Back”. Your settings are saved automatically.

Measurement

Setting	Meaning and operation
Hot (Max. / red)	You can choose temperature measuring points to be displayed in the live view. Select the desired temperature measuring points. To do this, tap the cross-hairs behind the terms. If the cross-hairs are highlighted in white, the temperature measuring point is enabled and will be displayed in the live view.
Cold (Min. / blue)	
Medium (Cen. / white)	

Table 11: Measurement

Image mode

Setting	Meaning and operation
Thermal	Only the thermal image is displayed in the live view. In this mode, the digital zoom [x] can be set in the live view [▶ page 28].
Fusion	A combination of the thermal and visual images is displayed in the live view. In this mode, the digital zoom [x] and the distance [m] can be set in the live view [▶ page 28]. The distance [m] to the target object is required to obtain a better overlap of the thermal and visual image and to minimise parallax errors.
PiP (picture in picture)	In the live view, the thermal image is displayed in the center of the visual image. In this mode, the digital zoom [x], the distance [m] and the size of the thermal image [%] can be set in the live view [▶ page 28].
Visual	Only the visual image is displayed in the live view. In this mode, the digital zoom [x] can be set in the live view [▶ page 28].
Blending	A blending of the thermal and visual images is displayed in the live view. In this mode, the digital zoom [x], the distance [m] and the optical-thermal ratio [%] can be set in the live view [▶ page 28].

Table 12: Image mode

Palettes

Setting	Meaning
Black Hot	The hot area is displayed dark.
White Hot	The hot area is displayed bright.
Ironbow	The hot area is displayed like red-hot iron.
Rainbow	The hot area is displayed in several colours. This view is suitable for objects without significant temperature differences.
Rain	The hot area is displayed in colour, the rest is displayed in blue.
Fusion	The hot area is displayed in yellow.
Red Hot	The hot area is displayed in red.
Blue Red	The hot area is displayed in blue.

Table 13: Palettes

Level and span

You can specify the temperature range. The level defines the temperature level and the span defines the temperatures within the displayed temperature range. These are applied to the selected colour palette in the view.

Setting	Meaning and operation
Auto	The device sets the displayed temperature range automatically.
Manual	<p>You can set the displayed temperature range manually.</p> <p>Procedure:</p> <p>Tap the area you want to check on the display.</p> <p>The device then draws a circle around the area and sets the temperature range so that as many details as possible can be recognised.</p> <p>To accept the values, tap the lock symbols at the upper and lower values of the temperature range.</p> <p>Alternatively, the temperature range can be set manually using the setting dial. To do this, tap on the upper or lower value of the temperature range to lock or unlock the respective value. After unlocking, the value can be set using the setting dial.</p> <p>Confirm by tapping “OK”.</p>

Table 14: Level and span

8 Operation

8.1 Requirements for measuring

- Please consider the brightness of the surrounding light conditions:
 - The ambient light must not be too bright.
 - Avoid measuring in direct sunlight.
- The device battery is fully charged.
- Please consider sources of interference that might be present. Strong sources of interference in the vicinity of the device might involve unstable readings and measuring errors.

8.2 Operating the camera live view

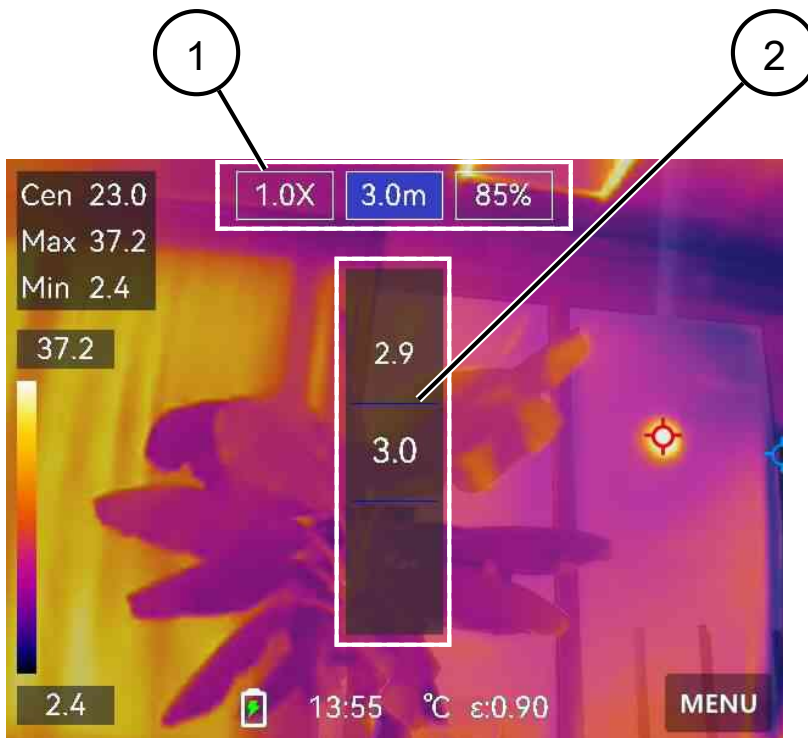


Figure 4: Operating the live view (using the “Blending” image mode as an example)

Depending on which image mode [▶ page 26] is selected, different setting options (1) are displayed. Tap the respective setting option (zoom [x] / distance to object [m] / optical-thermal ratio [%]). Set these options using the setting dial (2).

8.3 Temperature measurement

Requirements

- Please observe the requirements for measuring.
- You have configured the camera live view via the menu [▶ page 26].
- You have made the device settings in the local settings [▶ page 23].
- The device is not connected to the PC.
- In the camera live view, the menu is closed.

Procedure – Capturing a thermal image

In the camera live view, focus on the object to be checked and press the shutter button. Depending on the selected capture mode [▶ page 24], one or more thermal images are captured.

If you have selected scheduled or continuous capture mode, press the shutter button again to stop capturing.

The images created are saved in the standard storage album and can be selected and opened via the file manager [▶ page 29].

Procedure – Recording a video

In the camera live view, focus on the object to be checked and press and hold the shutter button for a few seconds until the video recording starts and the recording symbol is displayed.

Stop the recording by pressing the shutter button again. The recorded video is saved automatically.

The videos created are saved in the standard storage album and can be selected and played via the file manager [▶ page 29].

8.4 File management

Your files (image/video) are displayed in albums in the file manager. The following functions are available:




Symbol	Designation	Function
	Add	You can add a new album. The newly created album automatically becomes the default album for saving files.

Table 15: File management – Creating an album

Select an album to display the following functions:

Symbol	Designation	Function
	Previous file	Navigate through the album.
	Next file	You can display the previous or next file.




Symbol	Designation	Function
...	"Settings" submenu	When you open an album, you can choose from the following functions for the selected album in the submenu: <ul style="list-style-type: none"> You can set the selected album as the default album. To do this, tap "Set as Default Saving Album" function. You can assign a new name to the selected album. To do this, tap the "Rename" function. Enter the text and confirm your entry. You can delete the selected album. To do this, tap the "Delete" function and confirm the "Want to delete file?" prompt.
	Selection	Allows you to select one or more files. You can select all files using the  button and cancel the selection using the  button.

Table 16: File management – Editing an album

Select a file (image / video) and tap the file again to display the following functions:





Symbol	Designation	Function
	Text note	You can add a comment to a file.
	Move	You can move a file to another album.
	Information	You can open information on the file.
	Delete	You can delete the file.

Table 17: File management – Editing a file (image / video)

8.5 Transferring data to the PC

The image and video files stored on the device can be transferred to a PC.

Requirements

- PC with USB-A port and sufficient storage space
- USB-A to USB-C connecting cable

Procedure

1. Go to "Settings" > "Connections" > "USB Cast Screen" and disable "Cast Screen".
2. Switch off the device.
3. Connect the device to your PC using the USB-A to USB-C connecting cable.
When connecting for the first time, a driver is installed automatically.
The device can be recognised as a USB drive e. g. via Windows® Explorer.
4. Copy the files to your PC.
5. Disconnect the device from your PC.

8.6 Enabling the macro mode (optional)

You can enable the macro mode to view and better focus on very small objects.

Requirements

- Macro lens (item no.: 10237623)

Procedure

1. Attach the macro lens to the device so that it is flush with the camera lens.
2. Go to “Settings” > “Capture Settings” > “Macro Mode” and enable the “Macro Mode” function.
3. You can now set the emissivity [▶ page 23]. In the macro mode, you cannot make other settings such as distance, image mode and measuring range.

If you disable the macro mode, the device will revert to the previously set values. The measuring range is set to the “Auto Switch” [▶ page 17] mode.

8.7 Casting the device screen to the PC

You can use an external software application based on the UVC protocol (e. g. camera app under MS Windows®) to cast the device screen live to your PC screen.

Requirements

- PC with USB-A port and sufficient storage space
- USB-A to USB-C connecting cable

Procedure

1. Go to “Settings” > “Connections” > “USB Cast Screen” and enable “USB Cast Screen”.
2. Connect the device to your PC using the USB-A to USB-C connecting cable.
3. Open the external software application based on the UVC protocol (e. g. camera app under MS Windows®).

The device screen is now displayed on the PC.

If the device screen is not displayed, check whether you have selected the correct source (camera) in the camera app.

9 Maintenance

There are no components in the device that you can replace.

9.1 Maintenance schedule

The following table provides an overview of all maintenance and servicing work that you must carry out permanently or at regular intervals.

Interval	Measures
Regularly, as needed	<ul style="list-style-type: none"> • Cleaning the device
As needed / every 6 months	<ul style="list-style-type: none"> • Charging the battery
Every 12 months	<ul style="list-style-type: none"> • Calibrating the device [▶ page 33]

Table 18: Maintenance schedule

9.2 Cleaning the device

Clean the device regularly and as the need arises.

Requirements

- A clean and dry cloth or special cleaning cloth

NOTICE

Wrong cleaning agents

Using the wrong cleaning agents can damage the device.

- Do not use any solvents, abrasives or polishing agents.



NOTICE

Wrong cleaning agents

Using the wrong cleaning agents can damage the device.

- Do not use any solvents, abrasives or polishing agents.

Procedure

Clean the exterior of the device with a clean and dry cloth or a special cleaning cloth.

9.3 Calibrating the device

Benning guarantees compliance with this technical and accuracy specifications stated in this operating manual for the first 12 months after the delivery date.

To maintain accuracy of the measuring results, make sure that the device is recalibrated in annual intervals by the BENNING Service [▶ page 8].

As part of a calibration, the device is provided with the latest firmware update and thus always remains up to date.

<http://calibration.benning.de>



9.4 Updating the firmware

Requirements

- PC with USB-A port and sufficient storage space
- USB-A to USB-C connecting cable

Procedure

1. Download the device firmware from the product page of the device at <http://tms.benning.de/tc30>.
2. Switch off the device.
3. Connect the device to your PC using the USB-A to USB-C connecting cable.
The device can be recognised as a USB drive e. g. via Windows® Explorer.
4. Copy the device firmware as an unzipped file from your PC to the top level of the recognised USB drive.
5. Disconnect the device from your PC.
6. Switch on the device.

The device software is updated. Once the update is complete, the device restarts. The current version of the device firmware can be found under “Device Information” [▶ page 25].

10 Technical data

Contamination level	2
Protection category (DIN VDE 0470-1, IEC / EN 60529)	IP 54 1st digit: 5 = complete protection against accidental contact and protection against dust in harmful quantity 2nd digit: 4 = protection against splashing water from any direction
Housing dimensions (length x width x height)	144 mm x 25 mm x 85 mm
Drop test height	2 m
Weight	210 g
Electromagnetic compatibility (EMC)	EN 55032, EN 55035
Temperature measurement	
Measuring range	-20 °C to 400 °C
Measuring accuracy	Max. ± 2 °C (3.6 °F) or ± 2 % of the measured value at an ambient temperature of 15 °C to 35 °C (59 °F to 95 °F) and an object temperature above 0 °C (32 °F) *valid after a switch-on time of >30 minutes
AUTO measurement	<ul style="list-style-type: none"> • Maximum temperature (hot spot) • Minimum temperature (cold spot) • Medium temperature (center spot)
Thermal image	
Infrared resolution	256 x 192 (49,152 pixels)
NETD value (sensor sensitivity)	<40 mK (@ 25 °C, F#=1.0)
Frame rate	25 Hz
Spectral range	7.5 ... 14 μ m
Focal length	3.5 mm
Field of view (FOV)	50° x 37.2°
Focusing system / focusing distance	Fixed focus / min. 0.3 m
Visual image	
Resolution	Max. 8 MP (3264 x 2448)
Display	3.5 " (8.9 cm) LCD touchscreen (640 x 480 pixels)
Digital zoom	1.0 ... 4.0
Image mode	Thermal, Fusion, PiP (picture in picture), Visual, Blending
Colour palettes	Black Hot, White Hot, Ironbow, Rainbow, Rain, Fusion, Red Hot, Blue Red
Data storage and interface	
Storage type	Integrated flash memory 16 GB
Capacity	Approx. 60,0000 images or 54 hours of video recording time
File format	JPEG (images), MP4 (video)
WLAN	802.11 b/g/n (2.4 GHz, 5 GHz)
Interface	USB-C

Power supply	
Battery type	Rechargeable lithium-ion battery 3.85 V, 2.1 Ah
Operating duration	Max. 4 h (typical)
Charging time	2.5 h
Energy saving function	Automatic power-off after 10, 20, 30, 40 minutes or disabled
Operating conditions	
Operating temperature	-10 ... 50 °C (do not permanently expose the device to sunlight)
Max. relative air humidity	< 95 % (non-condensing)
Operating conditions	To be used inside or outside buildings, both in dry environments
Storage (remove the batteries from the device)	
Ambient temperature	-20 ... 60 °C (do not permanently expose the device to sunlight)
Max. relative air humidity	85 % RH

Table 19: Technical data

11 Disposal and environmental protection



At the end of product life, dispose of the unserviceable device via appropriate collecting facilities provided in your community.

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