TROTEC®

IC-V/-LV Series

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TRT-BA-ICVSERIES-HS-003-EN

OVERVIEW OF CONTENTS

01. READ THIS FIRST

Test Shots

Before you point your camera at any objects and start measuring, we highly recommend that you shoot several trial images to confirm that the IR camera is operating and being operated correctly.

Please note that GSAT, its subsidiaries and affiliates and its distributors are not liable for any consequential damages arising from any malfunction of an IR camera or accessory that results in the failure of an image to be recorded or to be recorded in a format that is machine readable.

Warning Against Copyright Infringement

Safety Instructions

Before using the camera, please ensure that you read and understand the safety instructions laid out below. Always ensure that the IR camera is operated correctly.

The safety instructions on the following pages are intended to instruct you in the safe and correct operation of your IR camera and its accessories in order to prevent any injuries or damage to yourself or other persons and equipment.

WARNING

Please read the following important instructions carefully:

⚠- *Risk of damage to eyesight*

Do NOT point the laser at people or at animals. This can result in severe damage to the eyes !

- *Disassembling the camera*

  Do NOT modify or disassemble the camera or any of its parts other than described in this manual.

- *Stop operating the camera immediately if it starts to emit smoke or toxic fumes.*

  Failure to do so may result in fire or electric shock. Immediately turn off the power of the camera remove the battery from the camera or unplug the power cord from the power outlet. Check to see that no more smoke or fumes are coming out of the camera.

- *Stop operating immediately you drop the camera or damage the housing.*

  Failure to do so may result in fire or electric shock. Immediately turn off the power of the camera, remove the battery from the camera or unplug the power cord from the power outlet.

- *Do not use substances containing alcohol, benzene, thinners or other flammable substances to clean or service the IR camera.*

  The use of these substances may cause a fire.

- *Remove the power cord at regular intervals and wipe away any dust and dirt that collects on the plug, around the the power outlet and the surrounding area.*

  In dust-filled, humid or greasy environments, the dust that collects around the plug over long periods of time may become saturated with humidity and short-circuit and cause a fire.

- *Do not grip or touch the power cord with wet hands.*

  If you grip or touch the power cord with wet hands, you are in severe danger of receiving an electric shock. Pull out the cord at the plug only. Do NOT tug at the cord. If you pull out the plug by the cord, you run a severe risk of damaging the wires or insulation which could in turn lead to a real danger of fire or electric shock.

- *Do not cut, alter or place heavy items on the power adapter cord.*

  Any of these actions may cause a short circuit, which may lead to fire or electric shock.

- *Use only the recommended power accessories.*

  Use of power sources not expressly recommended for this IR camera may lead to overheating, a deformation of the camera, fire, electric shock or other hazards.

- *Do NOT place the batteries near a heat source or expose them to heat or an open flame.*

  Do NOT immerse in water. Such exposure can lead to an explosion, fire or an electric shock. The corrosive liquid from a leaking battery can also cause serious damage and injury.

- *Do NOT take apart, alter or apply heat to the batteries.*

  There is a severe risk of explosion and injury. Immediately flush any area of the body, including the eyes and mouth and any clothing, that comes into contact with the contents of a battery with water. If the eyes and mouth come into contact with the battery's substances, flush thoroughly with water and seek medical help immediately.

- *Do NOT drop and prevent any damage to the battery as this could damage the battery's casing.*

  This could cause the battery to leak and cause serious injury.

- *Do NOT short-circuit the battery terminals with metallic object, such as key holders.*

  This could lead to overheating, burns and other injuries.

- *Before you disposing of your batteries, cover the terminal with tape or other insulators to prevent direct contact with other objects.*

  Contact with the metallic components of other materials in waste containers may lead to fire or explosions. Dispose of the batteries in specialised waste facilities if available in your area.

- *Use only recommended batteries and accessories.*

  Use of batteries not expressly recommended for this equipment may cause explosions or leaks, resulting in fire, injury and damage to the surroundings.

- *Disconnect the compact power adapter from both the IR camera and the power outlet after recharging and when the IR camera is not in use to avoid fires and other hazards.*

  Non-stop operation use over a long period of time may cause the device to overheat and deform, resulting in fire.

- *Do NOT use the battery charger or compact power adapter if the cable or plug is damaged or if the plug is not properly plugged in.*

  The battery charger can vary according to different regions.

- *Please exercise due caution when attaching the separately available tele and close-up lens.*

  If the lens becomes detached it may shatter and the glass splinters could cause injury.

- *If your camera is used over a longer period, the IR camera housing may become warm.*

  Please take care when operating the IR camera over a longer period as this may experience a burning feeling on your hands.

Camera Malfunctions

How to prevent your camera from malfunctioning.

- *Avoid any damage to the IR camera's detector.*

- *Avoid condensation*

  Moving the IR camera rapidly between hot and cold environments may cause condensation (water droplets) to form on surfaces both inside and on the outside of the camera.

  This can be avoided by placing the IR camera in the plastic case and allowing it to gradually adjust to the change in temperature before removing it from the case again.

- *When condensation forms inside the camera.*

  Stop using the camera immediately if you detect any condensation. Failure to do so may result in damage to the IR camera. Remove the SD card and the battery or a disconnect the camera from the mains and wait until the moisture has evaporated completely before resuming use.

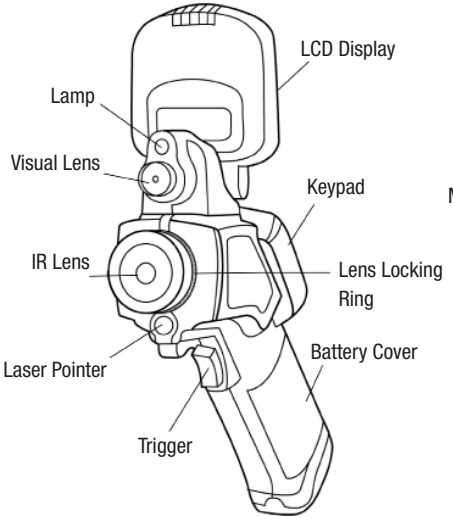
- *Storing over a longer period*

  If you are not planning on using your camera for a longer period, remove the battery from the IR camera or the battery charger and store in a safe place. If you store the camera without previously removing the battery,

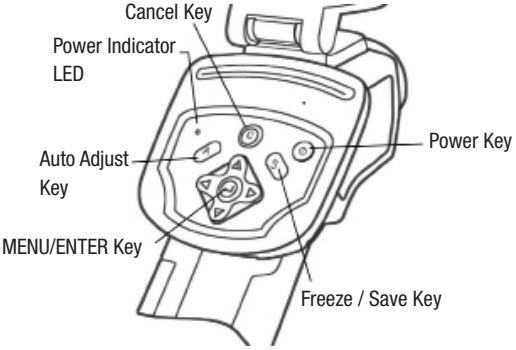
then the battery will run down.

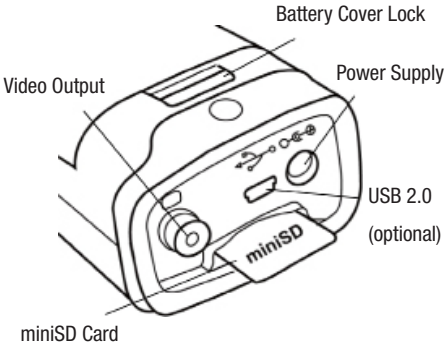
02. COMPONENT GUIDE

Front View



Keys / Docking Port



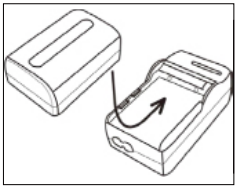


03. PREPARING THE IR CAMERA

Recharging the Battery

Proceed as follows when charging the battery for the first time. This procedure also applies for all subsequent charging cycles, which have to be carried out when the battery low symbol lights up in the display.

1. Position the edge of the charger so that it is on the same level as the line on the battery and insert the battery in the direction of the arrow.



2. Connect the power cord to the battery charger and plug the other end into a power outlet.

- The charge indicator lights up red while the battery is charging and lights up green when charging is complete.

⚠ ***WARNING: It is extremely important that you ensure that the first charging cycle lasts longer than 5 hours but not longer than 7 hours. Only this will ensure that the Li-ion cells are fully activated! Please also ensure that you only use a suitable charger to charge your battery.***

- When the charging cycle has been completed, disconnect the charger from the mains supply and remove the battery.

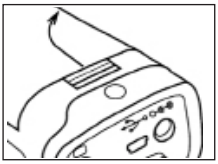
  Your camera is equipped with a lithium ion battery which does not have to be fully discharged before it can be recharged. The battery does, however, have a limited life and can be recharged approximately 300x. We therefore recommend that, as a rule, you only recharge the battery when it is exhausted or nearly exhausted.

  Charging times will vary according to the surrounding humidity and battery charge status.

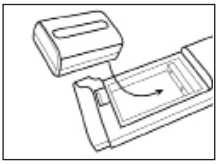
Inserting the Battery / SD Card

Insert the battery into the camera as follows:

1. Check that the power is off and open the battery cover in the direction of the arrow.



2. Insert the battery in the direction of the arrow.



3. Insert the SD card in the direction of the arrow.

⚠ ***Remove the battery when the camera is not in use.***

The SD Card must be formatted in FAT16 or FAT32. Otherwise the IR camera may not recognize the memory.

Camera

Battery Status Symbols

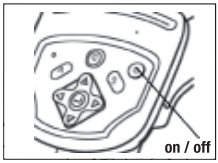
The following icons indicate the battery status on the LCD display.

	Battery is sufficiently charged
	Low battery
	Replace or recharge battery

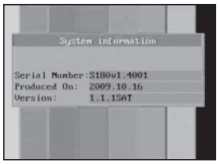
Powering On or Off

The power indicator shows that the camera is on and has sufficient battery power.

1. Hold the camera in your right or left hand, place your thumb above the keypad and rest your fore-finger gently on the trigger.



2. Press and hold the power switch for 3 seconds. The power indicator lights up green.

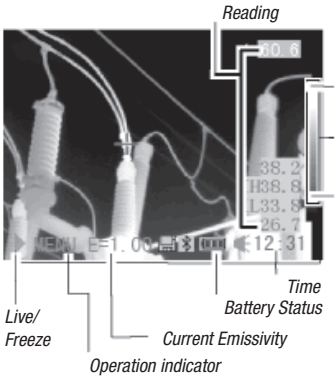


3. Shortly afterwards, a start-up image appears on the screen.
4. To power off press the power key and hold for 3 seconds. The power indicator goes off.

Information on the LCD Monitor

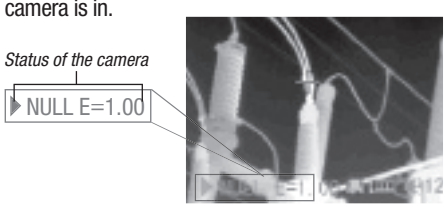
The LCD monitor has a field of vision of 100%.

The following view provides you with information on individual data:



Information regarding the operating indicator

The operating indicator shows which operating status the camera is in.



Menu . . . . . .shows the menu mode

Zero . . . . . Shows the non-menu. No analysis tools is selected

1 - 4. . . . . shows the current analysis tool is sport 1 or spot 2 or spot 3

Cap . . . . . shows that the tool has been selected to automatically track the measuring point (auto tracking)

Isot. . . . . shows the current analysis tool is isotherm analysis

E. . . . . current emissivity

. . . . . SD card inserted

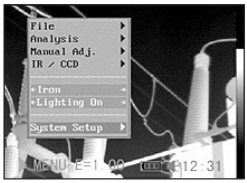
. . . . . Bluetooth headset has been installed

⚠ ***You will need to enter the zero mode before you start measuring with your camera. In order to do so press the Cancel key repeatedly until the required zero mode appears in the display.***

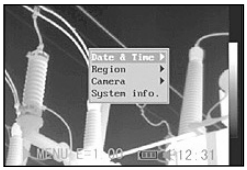
Setting the Time and Date

You need to set the time and date when the IR camera is powered up for the first time.

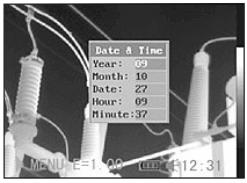
1. Check that the IR camera is in zero mode.
2. First press the MENU/ ENTER key and press the arrow ▲ up / down ▼ on the menu selector to get to the menu item [Setup]. Press the Menu/Enter key.



3. Press the up ▲ or down ▼ arrow on the omni selector to select [Date & Time] then press the MENU/ ENTER key.



4. Setting the time and date.
   - Press the up ▲ or down ▼ arrow on the omni selector to , select a field.
   - Press the arrow ◀ left / right ▶ in the menu selector to set the values.



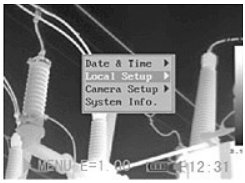
5. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings.

Individual settings

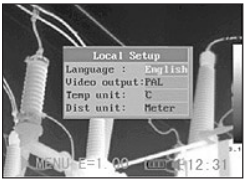
This menu item can be used to change the style of the menu system.

1. Check that the IR camera is in zero mode.
2. Press the MENU/ENTER key then press the up ▲ or down ▼ arrow on the omni selector to select the [Setup] menu.

3. Press the up ▲ or down ▼ arrow on the omni selector to select [Local], then press the MENU/ENTER key.



4. Local settings.
   - Press the up ▲ or down ▼ arrow on the omni selector to select a field.
   - Press the ◀ left or right ▶ arrow on the omni selector to set the values.



5. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings.

Local Settings

Language. . . . . selects the language used in the menus and messages

IR/Vision. . . . . selects the displayed mode

Temp unit. . . . . .sets the format of the displayed temperature unit of the camera (°C or °F)

Units of distance . . . . . sets the units of distance (meters/feet)

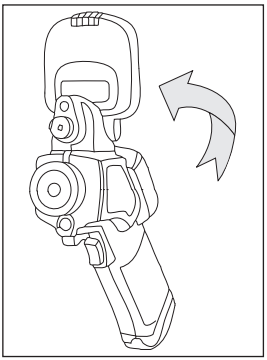
Video-out. . . . . .Sets the format (PAL / NTSC)

04. BASIC FUNCTIONS

Using the LCD Monitor

The LCD monitor can be used for measuring or to view thermal images and adjust menu settings.

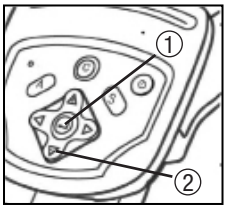
1. Open the LCD display in the direction of the arrow.
2. Point the IR camera at the measuring object.
   - For the best possible temperature readings please ensure that the measuring target is in the center of the display.
   - The LCD monitor will switch itself off when closed.



Selecting Menus and Settings

You can select the settings by pressing the MENU/ ENTER key.

1. Press the MENU/ENTER key. (1).
2. Press the ◀ left, right ▶ or up / down arrow (2) on the omni selector.
3. Press the MENU/ ENTER-key (1).

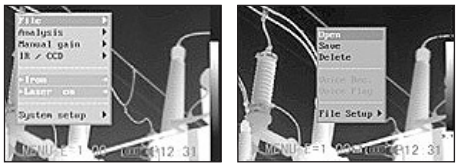


Example

1. Press the MENU/ ENTER key.

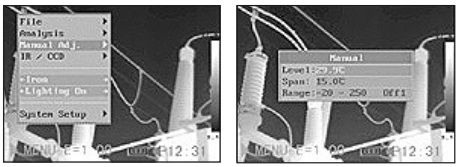
2. Use the omni selector to select a function.

Analysis Menu



File Menu

File Menu



Setup Menu

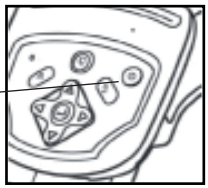
4. Use the omni selector to select a setting.

⚠ ***The menu items displayed can vary depending on the individual settings!***

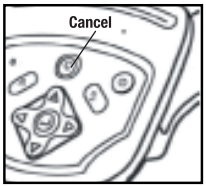
Performing a Reset

You can reset the menu and button operation settings to default.

1. Turn off the IR camera.



2. Press the C key and keep pressed. Now press the On/Off key and keep pressed for several seconds until the camera has powered on. Release the C key as soon as the message “init parameters” appears in the display.

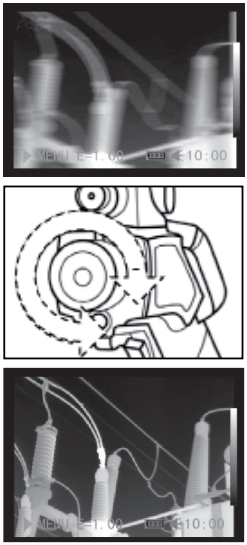


⚠ ***The data that is already stored in the memory will not be deleted when you reset the menu and button operation settings to default.***

05. MEASUREMENT

Manual Focusing

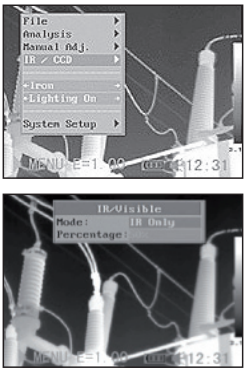
1. Check to ensure that the IR camera is in null mode.
2. Point the camera at the object you wish to measure.
3. Turn the focus ring until the measuring target is fully focused.
4. Do not stop turning the ring until you have a sharp image.



Thermal and Visual Images

The IR camera can take visual images with the built-in digital camera. Visual images can be used as a reference for thermal images.

1. Press the MENU/ENTER key.
2. Press the up ▲ or down ▼ arrow on the omni selector to select menu item [IR/CCD].
3. Press the ◀ left / right ▶ key on the omni selector to get to the menu item [IR / CCD-Setup] and press ◀ left / right ▶ to adjust the display mode.



IR. . . . . only the IR image is displayed

Vision. . . . . only the visual image is displayed

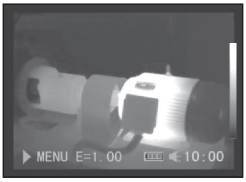
DuoVision . . . . . both the IR and the visual image are displayed

DuoVision

The DuoVision display modes allow thermal and visible images to be displayed as overlapping images.

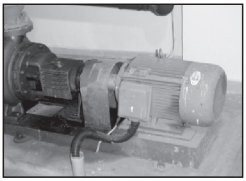
IR

In this mode, you can use the analysis tools to analyse the target. The image is partly displayed in pseudo-colours.

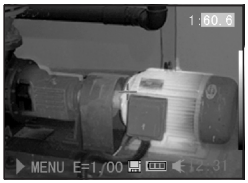


Vision

In this mode, you can see the image in full colour. But you can not use any analysis tools to analyse the target.



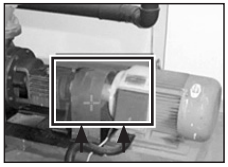
DuoVision



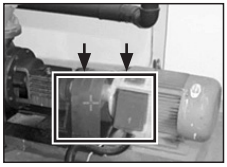
The IR image and the real image are displayed as overlapping images in this mode. At the same time you can use any analysis tools to analyze the target.
If the IR image is slightly displaced, press the C key and the arrow keys in order to adjust the thermal image so that it covers the visual image.

Moving the DuoVision Area

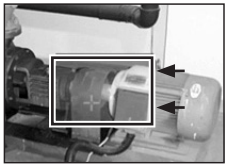
Move upwards (C + UP ▲)



Move downwards (C + DOWN ▼)



Move left (C + LEFT ◀)



Move right (C + RIGHT ▶)

⚠ ***WARNING! This setting depends on the distance to individual targets and is, for technical reasons, only possible in the scope of certain operations.***

Image adjustment

You can adjust the Level (brightness) and Span (contrast) of the image captured by the IR camera manually or automatically.

Automatic Settings

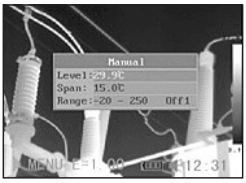
The IR camera will automatically adjust the brightness and / or contrast when you press the A key.

Manual Settings

You can adjust the Level and Span of the image manually in the built-in menu system or by pressing arrows on the omni selector. Press the ▲ up or down ▼ arrow to change the span, and press ◀ left or right ▶ arrow to change the level (only works in ZERO mode).

1. Press the MENU/ENTER key.
2. Press the ▲ up or down ▼ arrow on the omni selector to select menu item [Manual Adjust]

3. Setting the Level and Range.
   - Press the ◀ left or right ▶ arrow on the omni selector to select a new field.
   - Press the ▲ up or down ▼ arrow on the omni selector to set the values.



4. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings

Image Settings

Palette

Sets the pseudo-colors of the thermal image. The camera provides 6 palettes: Iron, Iron inverted, Rainbow, Feather, Grey and Grey inverted.

1. Press the MENU/ENTER key.
2. Press the ▲ up or down ▼ arrow on the omni selector to select the menu item [Iron] ,then Press the MENU/ENTER key. Press the ◀ left/right ▶ key to select the desired colour.

Further Settings

1. Press the MENU/ENTER key and change to the item Settings [System Setup]. Confirm your entry.

2. Press the ▲ up or down ▼ arrow on the omni selector until you reach the menu item [Camera Setup] and press the MENU/ENTER key.

3. Selecting image settings.
   - Press the ▲ up or down ▼ arrow on the omni selector to reach a new box.
   - Press the ◀ left or right ▶ arrow on the omni selector to select a new setting.
4. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings.

About the Image Settings:

• *Auto adjust*

Sets the function of the A key. There are three options: Level and Range, Level, Range.

- Level and Range

The camera will automatically adjust the level (brightness) and range (contrast) of the image to the optimum setting.

- Level

The camera will automatically adjust the level (brightness) of the image.

- Range

The camera will automatically adjust the range (contrast) of the image.

• *Continuous adj*

Determines if the brightness and the contrast are adjusted automatically on the monitor while the user is operating the camera

- Level and range

The brightness and contrast are adjusted automati-cally.

- Level

The camera will automatically adjust the level (brightness) of the image.

- None

The brightness and contrast will not be adjusted automatically.

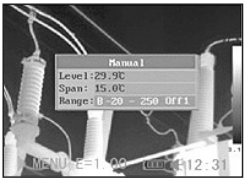
Measuring Range

The brightness can be reduced by using the integrated filter or an additional filter lens.

1. Press the MENU/ENTER key.
2. Press the ▲ up or down ▼ arrow on the omni selector to select the menu item [Manual Adj.], then press MENU/ENTER key.

3. Setting measuring range.
   - Press the ◀ left or right ▶ arrow on the omni selector to select a range.

   - Press the ▲ up or down ▼ arrow on the omni selector to set measuring range.
4. Selecting the measuring range when using optional lenses.
   - Having selected the box for the measuring range, press the keys ▲ up or down ▼ simultaneously to set the temperature range for the lens in use.



	Type	Null	A	B	C	D	E
IC-V	Lens	20°	12.8°	38°	3.8°	6.4°	9°
IC-L/LV	Lens	24°	12°	48°	–	–	–

5. Press the MENU/ENTER key to close the window when this step is completed.

⚠ ***A suitable high temperature filter must be screwed in front of the lens when the temperature range exceeds 1000 °C! If such a filter lens is not available or does not fit on the lens you are using, then do NOT on any account carry out any high temperature measurements above 1000 °C as this would otherwise damage the detector beyond repair!***

Freezing / Activating an image

You can freeze or activate a thermal image by pressing the S key on the selector.

1. Check that the IR camera is in zero mode.
2. Press the S key to freeze the image.
3. Press the S key again then the image is active.

Setting Analysis Parameters

1. Press the MENU/ENTER key.
2. Press ▲ up and down ▼ arrow on the omni selector to select [Obj par.], then press the MENU/ENTER key.

3. Setting analysis parameters.
   - Press the arrow ▲ up / ▼ down on the selector to get to the menu item [Object Para.].

   - Press the arrow ▲ up / down ▼ or the arrows ◀ left / right ▶ on the omni selector to set the values for the object that is to be measured.
4. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings.

Information regarding the analysis parameters

Emiss

Different objects have different emissivity values. Set the relevant emissivity values to measure different objects.

Distance

Objects can be at different distances from the IR camera. Set the respective distance to the measuring object.

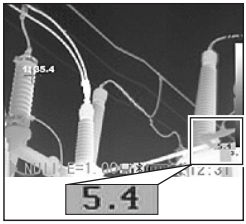
Amb Temp

Enter the ambient temperature or Trefl., ie, the surface temperature of radiating/reflecting objects which are close to the surface you wish to measure and which could have an effect on the ensuing measurement.

Humidity

Enter the ambient humidity.

Obj Comparison



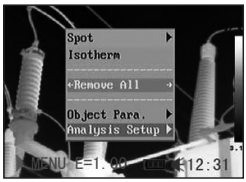
COMPAROBJ1 can be set to denote either a measuring spot or an area. COMPAROBJ2 can be set to denote either a reference temperature, a measuring spot or an area. The difference between the temperatures measured with 1 and 2 is displayed in the bottom right-hand corner of the LCD, e.g. COMPAROB is SPOT1 (35.4°C) and COMPAROBJ 2 is REF TEMP (30°C), then the difference between the 2 values is 5.4°C.

Ref Temp

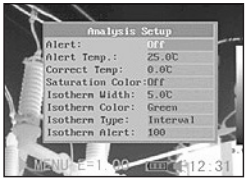
Acts as a means of comparison with a spot, area or profile

Analysis Settings

1. Press the MENU/ENTER key.
2. Press the ▲ up and down ▼ arrow on the omni selector to select the [Setup] menu, then press the MENU/ENTER key.



3. Press ▲ up and down ▼ arrow on the omni selector to select [Analysis Setup], then press the MENU/ENTER key.
4. Setting analysis parameters.
   - Press the ▲ up or down ▼ arrow on the omni selector to select a new field.
   - Press the ◀ left / right ▶ arrow on the selector to set the values.



5. Press the MENU/ENTER key to save the changes or press the C key to close the window without saving any new settings.

About the analysis settings:

Alarm

The temperature alarm can be activated or deactivated. When the temperature alarm is activated, the measuring value of Spot 5 (EC 060 V) / 10 (EC 060 V+) is displayed in red when the setting "Maximum" has been previously selected and the temperature of the measuring point is equal to or greater than the defined alarm temperature. When Spot 5 has been set to "Minimum" when the measuring point is measured and the temperature is either identical to or lower than the defined alarm temperature, then the temperature value also appears in alarm mode.

Alarm temp

Sets the alarm temperature thresholds.

Correct temp

Corrects the measured temperature reading to ensure measurement accuracy under special conditions. Zero point offset of the calibration curve.

⚠ ***WARNING: Zero point displacement of the calibration curve!***

Saturation colour

When activated, the width of the image with the highest temperature is coloured green.

Isotherm width

Sets the width of isothermal intervals. The width can be adjusted from 0.1 to the upper limit of the maximum temperature measuring range under this condition.

Isotherm colour

Sets the colour of the isotherm interval to either green, black or white or to transparent.

Isotherm Type

Isotherm Type	**Dual Above**	Shows all temperatures within the set isotherm intervals in one colour and in addition all areas which are warmer than the upper interval threshold in a different colour.
	Dual Below	Shows all temperatures within the set isotherm intervals in one colour and in addition all areas which are colder than the lower interval threshold in a different colour.
	Above	Shows the isotherm interval and all areas which are warmer than the upper interval threshold in the same colour.
	Below	Shows the isotherm interval and all areas which are colder than the upper interval threshold in the same colour.
	Interval	Shows the set isotherm interval in one colour. The rest of the image is displayed in IR pseudo colours.

Isotherm alarm

The alarm threshold value can be set between 1 and 100 and describes the proportion (in %) between 1/100 and 100/100 of the area of the LCD, eg. the isotherm range is between 35°C and 40°C and the Iso-Alarm is 100. In this case the alarm is triggered when 100% of the area shown in the LCD is between 35°C and 40°C and the whole area of the LCD is correspondingly "isotherm"- coloured. If the alarm threshold value is set, for example, at 40, the alarm will be triggered when 40% of the area of the LCD is "isotherm"- coloured.

Spot Analysis

The following subject matter briefly explains how to set the analysis tools on the thermal image.

1. Press the MENU/ENTER key.
2. Press the up ▲ or down ▼ key on the omni selector to get to the menu item [Analysis].

3. Setting the spot analysis

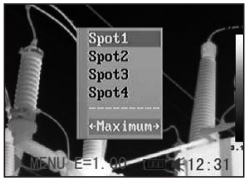
- Press the up ▲ or down ▼ arrow on the omni selector to select a spot, then press MENU/ ENTER key. One or more crosshairs will appear on the screen.

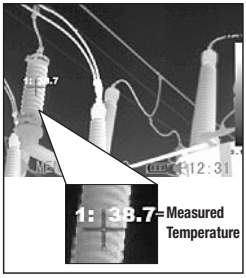
- Spot 5 will automatically track the highest or lowest spot on the screen.

4. Moving the analysis spot

- Start from Step 1 to set or select a spot analysis.
- Press the up ▲, down ▼, left ◀, right ▶ arrow on the omni selector to move the activated spot.

  Temperature value of the current spot will be modified





5. Removing the measuring spots.

- Start with Step 1 and select the measuring spot you wish to remove.
- Press C to remove the measuring spot.

Tracking the measuring spot

Set Spot 5 or Spot 10 so that it tracks the highest/ lowest point on the display.

- Maximum

  Set Spot 5 so that it always follows the hottest spot in the display.

- Minimum

  Set Spot 5 or 10 so that it always follows the coldest spot in the display.

Colour settings for the temperature measuring spot

1. Press the MENU/ENTER key and go to the menu item Analysis. Confirm your entry.
2. Press the ▲ up/down ▼ arrows on the omni selector button to get to the menu item Analysis Setup and press the MENU/ENTER key.
3. Go to the submenu item SpotTemp Color and press the ◀ left/right ▶ arrows to select the colours of your choice.

There are 8 different colours available:

- White, black, blue, red, purple, green, marine, yellow.

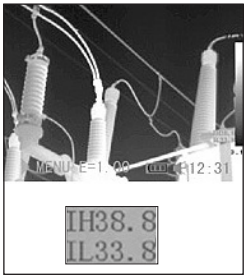
Isotherm analysis

1. Press the MENU/ENTER key.
2. Press the ▲ up and down ▼ arrow on the omni selector to select the [Analysis] menu.

3. Press the arrow ▲ up / down ▼ to get to the menu item [Isotherm] and press the MENU/ ENTER key. Areas that are not within the selected isotherm range are displayed in a different colour.

4. Set the isotherm range.

- Start from Step 1 to set or select the isotherm analysis.
- Press the arrow key ▲ up / down ▼ on the omni selector to move the isotherm range upwards or downwards. Press the ◀ left / right ▶ key to increase or decrease the isotherm range by changing the lower isotherm level (IL).

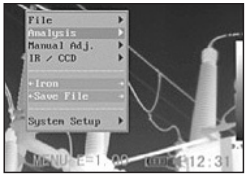


- IL and IH will appear at the bottom right corner. It is the highlimit (IH) and low limit (IL) of the iso therm range.

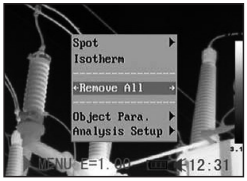
Removing Analysis Tools

The following subject matter briefly explains how to remove the analysis tools that have been placed on the screen.

1. Press MENU/ENTER.
2. Press the up ▲ and down ▼ arrow on the omni selector to select the menu item [Analysis].



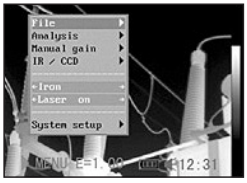
3. Select the analysis tool you wish to remove.
4. Press the C key to delete the tool or press the MENU/ENTER key to delete all the analysis tools.



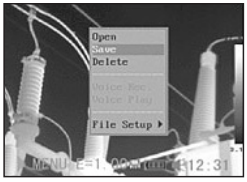
Saving Images

Press the S key to save a previously frozen image into the memory. You can also save an image into the memory without freezing it first by keeping the key on the omni selector pressed for 3 seconds while the camera is in zero mode.

1. Press the MENU/ENTER key.
2. Press the ◀ left or right ▶ arrow on the omni selector to select the menu item [File].



3. Press ▲ up and down ▼ arrow on the omni selector to select [Save], then press the MENU/ENTER key to save the image.The display mode shows the memory mode.



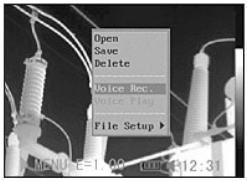
4. The name of the saved image will be displayed on the screen.

Voice Annotations (optional)

A voice-recording of 30 sec. is possible for each image.

1. Install the Bluetooth headset (optional).
2. To freeze an image press the MENU/ENTER key.
3. Press the ▲ up/ down ▼ arrow on the omni selector to select the [File] menu.

4. Press ▲ up/down ▼ arrow on the omni selector to select [VoiceREC.], then press the MENU/ENTER key. The message [Voice Recording] will appear on the LCD monitor.



5. Speak into the headset microphone. To stop recording press the C key.
6. Save the image. The voice annotations that can be added to the individual images do not affect, ie. reduce the capacity of the memory.

Trigger Settings

The trigger can be set to perform a variety of different functions: it can be used to store images or to switch the laser or the lamp on or off.

1. Press the MENU/ENTER key and then the arrow ▲ up / down ▼ on the omni selector to get to the menu item [Lighter on] and press the MENU/ENTER key.

2. Press the up and down arrow on the omni selector to select menu item [Others] and then press the MENU/ENTER key.

Trigger Information

Save: Press the trigger to save an image.

Laser on: Press the trigger to activate the laser.

Lamp on: Press the trigger to turn on the integrated lamp.

06. RECORDING AND DELETING

Opening Images

You can view and analyse the recorded images on the LCD monitor.

1. Press the MENU/ENTER key.
2. Press the ▲ up and down ▼ arrow on the omni selector to select the [File] menu.

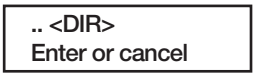
3. Press ▲ up and down ▼ arrow on the omni selector to select [File], then press the MENU/ENTER key.

4. Select an image, then press MENU/ENTER key to open the image. You can choose to analyse an image or add your own voice annotations after the image has been opened.

Selecting Images

1. When you have selected [Open] or [Delete] in the [File] menu, a message will appear in the lowerleft-hand corner of the screen as shown below.

2. If the image you wish to open or delete is not in the current folder, press the [UP] arrow on the omni selector until the following message appears.



3. Press the C key and then the S key to activate the image.

Selecting the Name of the Current Folder

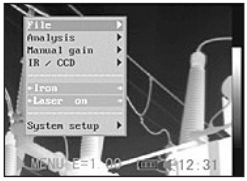
1. Press the MENU/ENTER key.
2. Press the ▲ up and down ▼ arrow on the omni selector to select the menu item [Setup], then press the MENU/ENTER key.

3. Press the ▲ up and down ▼ arrow on the omni selector to select menu item [File Setup] menu, then press the MENU/ENTER key.

4. Press the ▲ up and down ▼ arrow on the omni selector to select the menu item [Directory name], then press the ◀ left or ight ▶ arrow to select the folder. Press the keys A, C and S together to set the name of the file to SAT00000.

Voice Annotations

1. Install the Bluetooth headset (optional) and open an image.
2. Press the MENU/ENTER key, then press the up or down arrow on the omni selector to select



the [File] menu and confirm.

3. Press the ▲ up or down ▼ arrow on the omni selector to select [Voice Play], then press the MENU/ ENTER key. The [Playing Record] message will appear on the LCD monitor.

4. Press the C key to delete the voice annotation.

Deleting Images

⚠ ***Please note that deleted images cannot be recovered. Exercise caution before deleting any images !***

1. Press MENU/ENTER key then press ▲ up or down ▼ arrow on the omni selector to select the [File] menu.

2. Press ▲ up or down ▼arrow on the omni selector to select [Delete], then press the MENU/ENTER key.

3. Select an image, then press the MENU/ENTER key to delete the selected image.

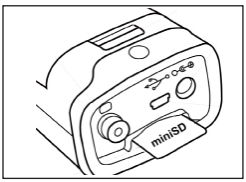
4. Press the C key to exit.

07. READING OUT IMAGES

Reading Out Images from the SD Card

You can remove the SD card from your camera and download the images to your computer via the supplied SD card reader.

1. Open the housing at the end of the grip and gently press the SD card. The SD card is released automatically.



2. You can download the IR images directly from SD card or via SD card reader.

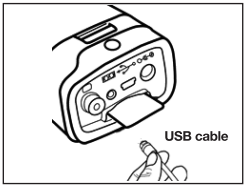
⚠***WARNING: Do not at any time change the file name to one that you have thought up yourself. This could lead to the memory card not being able to identify the file and stop the memory from booting successfully.***

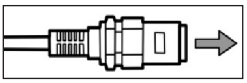
08. CONNECTING AND READING OUT

Connecting to a monitor

The camera can be connected to a video-compatible monitor to view and analyse images via the video cable included in the scope of delivery .

1. Turn off the IR camera.
2. Connect the video cable to the video out terminal of the multi-function docking station.
3. Plug the other end of the video cable into the monitor‘s in jack
4. Turn on the monitor and the IR camera.





5. If necessary, please switch the video format in the camera setup menu from PAL into NTSC or vice versa.

Connecting to a Computer
(only possible with cameras with USB interface or real-time capability)

Place the software CD in the drive of your PC. The installation routine starts automatically.

Connect the dongle included in the scope of delivery to a free USB port. You will not be able to open the software without the dongle. Select “show” => “IR-

camera model" in the menu to determine which type of camera you wish to connect to your PC. As a rule, there is no need to turn off either your PC or your camera while the two are being connected.

You may have to contact your computer administrator in order to find out more about the exact location of the USB port on your computer. If you have one of the predecessor cameras in the IC Series (with real-time capability), it is essential that you follow the steps below when connecting your camera to your PC, otherwise you may find that your PC will not be able to recognise your camera:

- Connect one end of the USB cable to your computer.
- Switch on your camera and wait several seconds until the vertical colour bars appear in the LCD display.
- Now connect the other end of the USB cable to the USB port of your camera while the bars are still visible.

You will automatically be requested to install the driver when your computer has recognised the camera. Please proceed as follows:

Installing the driver
(only for optionally available real-time software)

Please note that, depending on the operating system you are using, you may have to log in as administrator in order to be able to install certain programs.

⚠ Users of Windows XP Professional / Windows 2000 / VISTA must first log in as administrator to install programs.

1. After a few moments, the following dialogue will appear.

2. Select [No, not this time] then click [Next >].

3. Select [Install from a list or location (Advanced)] then click [Next >].

4. Select [Include this location in the search:] then click [browse]. Locate the directory of the driver, and click [OK] to return to the previous window. Then click [Next >].

5. Click [Continue Anyway].

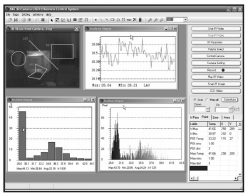
6. Click [Finish] to complete the driver installation.

Image/video transfer via USB

Please follow the steps below to transfer fully radiometric real-time IR videos via US cable to your PC (only possible with cameras with USB interface and in connection with USB real-time software!).

1. Power on the computer.
2. Connect the camera and your computer via the USB cable.

3. The operating system will recognise your camera as a removable medium if the drivers have been installed correctly.
4. You can use the software to view and analyse thermal videos in real-time and to save them on to your hard drive.



Configuring the USB interface

1. Press the MENU/ENTER key and go to the menu item System Setup. Confirm your entry.
2. Press the ▲ up/down ▼ arrows on the omni selector button to get to the menu item Camera Setup and press the MENU/ENTER key.
3. Go to the submenu item USB-Type and press the ◀ left/right ▶ arrows to select the USB interface for your camera.

There are 2 different settings available.

- USB Real-Time:
  Select this setting when using your camera together with the optionally available USB real-time software. The USB interface can be used to transfer fully radiometric IR videos for initial or further assessment or for future documentation in real time to your PC.
- USB Remove Disc:
  Select this setting when you wish to read out the images that have been saved to the camera via the USB connection between your camera and your PC. In this mode, your PC will recognise your camera as a removable medium.

Troubleshooting

If you wish to use the optional real-time software and encounter any problems while connecting your IR camera to a computer, please read the following tips and advice.

First, check the following:

1. Does your computer comply with these requirements?

   Ensure the system has a built-in USB port and comes with Windows 98 (First or Second Edition), Windows Me, Windows 2000 or Windows XP/VISTA preinstalled.

   The USB interface idoes not support systems which do not comply with the above conditions.
2. Is the camera connected correctly to your computer? See „Connecting your camera to a computer“.
3. Is the battery sufficiently charged?
   We advise that you connect your camera to the mains supply when it is connected to your computer (mains adapter optional).
4. If the USB driver is not correctly installed, Windows may not recognise the USB driver. Please contact the manufacturer of your motherboard to get the latest driver updates.
5. The USB2.0 real-time transmission function may not work properly with some motherboard chipsets. In this case, connect the IR camera to another computer which has a chipset which is in the chipset supporting list and try again.

Using the Bluetooth headset

Your infrared camera has Bluetooth. The optionally available Bluetooth headset can be used to record voice annotations. Follow the steps below to install your Bluetooth headset.

1. Turn off the camera and the Bluetooth headset.
2. Turn on the Bluetooth headset first. Press and hold the power button (A) for about 5 seconds. The power indicator starts to blink in red and then blue. The headset is in pairing mode after 2 seconds. The LED blinks more slowly and turns to blue.
3. Turn on the camera while the Bluetooth headset is still blinking. The camera‘s power indicator lights up green and blinks in blue at the same time. The camera is preparing to connect with the headset.
4. When the headset is in pair mode press the power button of the Bluetooth headset for about 2 seconds to set up a connection between the headset and the camera. The camera‘s LED starts to blink in shorter one-second intervals. Press the ON/OFF key of your Bluetooth headset. The Bluetooth sym-

bol appears in the camera display. The camera LED now lights up permanently in green and blue! The Bluetooth mode is now activated.

5. When you use the Bluetooth headset a second time, first turn on the headset. The blue power indicator starts to blink. Then turn on your camera. When the camera has powered up, repeat the procedure as described in Step 4 to activate the Bluetooth mode again.

6. You can use the headset to record voice annotations and to listen to ones you have already made.

The Bluetooth headset has been successfully recognised.

1. Switching off the Bluetooth headset:

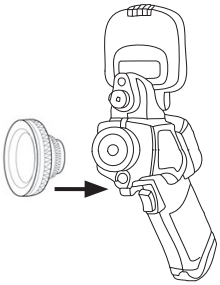
   Press and hold the ON/OFF key until the red LED lights up.

2. Switching on the Bluetooth headset:

   Press and hold the ON/OFF key until the blue LED lights up. To charge simply connect the headset to your PC via the USB cable included in the scope of delivery.

Optional accessories

- Various lenses
- Additional power supply
- Transport case



09. CARE AND MAINTENANCE

Use the following procedures to clean the camera housing, lens, LCD monitor and other parts.

Camera housing

Wipe the housing with a clean, soft, lint-free cloth or eyeglass wipe.

Lens

Use a blow brush to remove any dust from the lens and use a clean, dry cloth to remove any dirt or particles that may still be on the lens. Do NOT use caustic cleaning agents to clean the camera housing or the lens.

LCD monitor

Use a lens blower brush to remove dust and dirt. If necessary, gently wipe the LCD monitor with soft cloth or an eyeglass wipe to remove stubborn dirt.

Never rub or apply pressure to on the LCD monitor. This may cause damage or result in other problems.

Never use thinners, benzene, synthetic cleaners or water to clean the camera. These substances may cause deformations or damage the equipment.

10. TROUBLESHOOTING

Problem	*Cause*	*Solution*
Camera doesn´t work.	Power is not turned on.	Turn on the camera. See Turning the Power On / Off.
	Insufficient battery voltage.	Fully charge the battery.
	Poor contact between camera and battery terminals.	Wipe the terminals with a clean, dry cloth.
	The camera has frozen up.	Reset the camera.
Camera will not record.	Internal memory is full.	Save the images onto your computer and delete them from the SD card.
	Internal memory not formatted correctly.	Format the internal memory in FAT32 format.
Battery power exhausted.	Battery capacity reduced because battery was not used for a year or longer after being fully charged.	Replace the battery with a new one.
	Battery life is at the end of its life.	Replace the battery.
Battery will not charge.	Poor contact between battery and battery charger.	Clean the battery terminals with a clean cloth. Connect the power cord to the battery charger and insert the plug firmly into the power outlet.
	Battery is at the end of its life.	Replace the battery.

11. EMISSIVITY TABLE

Material	Temperature (°C)	Emissivity (approx.)
Aluminium		
Polished aluminium	100	0.09
Commercial aluminum foil	100	0.09
Electrolytic chromeplate alumina	25 ~ 600	0.55
Mild alumina	25 ~ 600	0.10 ~ 0.20
Strong alumina	25 ~ 600	0.30 ~ 0.40
Copper		
Cuprous oxide	800 ~ 1100	0.16 ~ 0.13

Material	Temperature (°C)	Emissivity (approx.)
Copper		
Copper mirror	100	0.05
Strong copper oxide	25	0.078
Liquid copper	1080 ~ 1280	0.16 ~ 0.13
Brass		
Brass mirror	28	0.03
Brass oxide	200 ~ 600	0.61 ~ 0.59
Chrome		
Polished chrome	40 ~ 1090	0.08 ~ 0.36
Gold		
Gold mirror	230 ~ 630	0.02

11. EMISSIVITY TABLE

Material	Temperature (°C)	Emissivity (approx.)
Iron		
Polished cast iron	200	0.21
Processed cast iron	20	0.44
Polished tempered iron	40 ~ 250	0.28
Polished steel ingot	770 ~ 1040	0.52 ~ 0.56
Raw welded steel	945 ~ 1100	0.52 ~ 0.61
Surface ferric oxide	20	0.69
Completely rusty surface	22	0.66
Rolled iron plate	100	0.74
Oxidized steel	198 ~ 600	0.64 ~ 0.78
Cast iron (oxidised at 600°C)	198 ~ 600	0.79
Steel (oxidised at 600°C)	125 ~ 520	0.78 ~ 0,82
Electrolytic ferric oxide	500 ~ 1200	0.85 ~ 0.89
Iron plate	925 ~ 1120	0.87 ~ 0.95
Cast iron, heavy ferric oxide	25	0.80
Tempered iron, ferric oxide	40 ~ 250	0.95
Melting surface	22	0.94
Melting cast iron	1300 ~ 1400	0.29
Melting mild steel	1600 ~ 1800	0.28
Liquid steel	1500 ~ 1650	0.42 ~ 0.53
Pure lead	1515 ~ 1680	0.42 ~ 0.45
Silver		
Polished silver	100	0.05

Material	Temperature (°C)	Emissivity (approx.)
Nickel		
Nickel-chrome (heat resistant)	50 ~ 1000	0.65 ~ 0.79
Nickel-chrome alloy	50 ~ 1040	0.64 ~ 0.76
Nickel-chrome alloy (heat resistant)	50 ~ 500	0.95 ~ 0.98
Nickel-silver alloy	100	0.14
Lead		
Pure lead (Non-oxidised)	125 ~ 225	0.06 ~ 0.08
Stainless steel		
18 - 8	25	0.16
304 (8Cr, 18Ni)	215 ~ 490	0.44 ~ 0.36
310 (25Cr, 20Ni)	215 ~ 520	0.90 ~ 0.97
Tin		
Commercial tin plate	100	0.07
Strong oxidization	0 ~ 200	0.60
Zinc		
Oxidised at 400°C	400	0.01
Galvanised shining iron plate	28	0.23
Ash zinc oxide	25	0.28
Magnesium		
Magnesia	275 ~ 825	0.55 ~ 0.20
Hg	0 ~ 100	0.09 ~ 0.12
Nickel		
Electroplate polishing	25	0.05
Electroplate	20	0.01
Nickel wire	185 ~ 1010	0.09 ~ 0.19
Nickel alloy (oxide)	198 ~ 600	0.37 ~ 0.48

11. EMISSIVITY TABLE

Material	Temperature (°C)	Emissivity (approx.)
Non-metallic materials		
Brick	1100	0.75
Firebrick	1100	0.75
Graphite (lamp lack)	96 ~ 225	0.95
Porcelain enamel (white)	18	0.90
Asphal	0 ~ 200	0.85
Glass (surface)	23	0.94
Calcimine	20	0.90
Oak	20	0.90
Carbon piece		0.85
Isolation piece		0.91 ~ 0.94
Sheet metal		0.88 ~ 0.90
Glass pipe		0.90
Porcelain enamel products		0.90
Porcelain enamel designs		0.83 ~ 0.95
Solid materials		0.80 ~ 0.93
Ceramics (vase type)		0.90
Film		0.90 ~ 0.93
Heat-resistant glass	200 ~ 540	0.85 ~ 0.95

Material	Temperature (°C)	Emissivity (approx.)
Non-metallic materials		
Mica		0.94 ~ 0.95
Flame mica		0.90 ~ 0.93
Glass		0.91 ~ 0.92
Semiconductor		0.80 ~ 0.90
Transistor (plastics sealed)		0.30 ~ 0.40
Transistor (metal) diode		0.89 ~ 0.90
Pulse transmission		0.91 ~ 0.92
Level chalk layer		0.88 ~ 0.93
Top loop		0.91 ~ 0.92
Electric materials		
Epoxy glass plate		0.86
Epoxy hydroxyben-zene plate		0.80
Gilded sheet copper		0.30
Solder-coated copper		0.35
Tin-coated lead wire		0.28
Brass wire		0.87 ~ 0.88
Block talcum terminal		0.87

12. TECHNICAL DATA

Technical data		V Series	LV Series
Article no.		IC 080 V: 3.110.003.011 IC 0120 V: 3.110.003.019	
Measuring	Temperature range	-20 °C to +600 °C -20 °C to +1.500 °C	-20 °C to +600 °C -20 °C to +1.500 °C
	Accuracy	±2 °C, ±2% of the measured value	
	Detector type	Focal Plane Array (FPA), uncooled microbolometer	
	Detector resolution	160 x 120 pixels	384 x 288 pixels
	Spectral range	8 to 14 µm	7,5 to 14 µm
	Field of Vision (FOV)	20 °C x 15 °C	24 °C x 21 °C
Image output radiometric	Geometric resolution	2.2 mrad	1.1 mrad
	Thermal sensitivity	0.08 °C to 30 °C	0.05 °C to 30 °C
	Image refresh rate	50/60 Hz	
	Focus	manual	
	Min. focusing distance	0,10 m	
Image performance visual	Digital photo camera	Colour depiction 680 x 480 pixels, integrated lamp	
	Video norm	PAL/NTSC	
Image representation	Image display	2.5˝ LCD, pseudo colours, 6 colour palettes	
	Image display options	IR image, digital image, 4 DuoVision combinations of IR and digital image	
	Measuring points	Up to four moveable measuring points (5 x manual and 4 x automatic)	
	Isotherm	Yes (between the upper and lower limit values)	
Measuring functions	Emissivity factor	Variably adjustable from 0.01 to 1.0	
	Measurement correction	Automatic on the basis of user-defined specifications for environmental temperature, distance, relative humidity	
Image storage	Storage medium	Interchangeable memory card slot for mini-SD card	
	Data format radiometric	14 bit radiometric IR format	
	Data format visual	CCD	
	Voice recording	Comments can be stored with each IR image (optional Bluetooth expansion kit and Bluetooth headset necessary)	

Technical data		V Series	LV Series
Laser	Type	Semiconductor AlGaInP Diode Laser, 1 mw/635nm red	
	Classification	Class 2	
	Battery type	Rechargeable standard lithium-ion battery, replaceable	
Power supply	Operating time	≈ 2.5 h	
	Mains operation	8 - 11 V DC	
	Energy saving mode	User-defined	
Ambient conditions	Operating temperature	-15 °C to +50 °C	
	Storage temperature	-40 °C to +70 °C	
	Air humidity	10 % to 95 % RH (non-condensing)	
	IP rating	IP 54 IEC 529	
	Shockproof	up to 25G IEC 68-2-29	
	Vibration proof	up to 2G IEC 68-2-6	
Physical parameters	Dimensions	230 x 80 x 195 mm	
	Weight	500 g	650 g
	Stand mounting	1/4-inch - 20	
Interfaces	PC	USB 2.0	
	Video output	Composite Video	
Package contents	Standard lens	20° x 15°	24° x 21°
	Standard equipment	Camera with standard lens, LCD display and laser, battery charger 110/230 Volt (IC090 Ex-protected) with charging status indicator, Li-ion battery (IC090 two Ex-protected special rechargeable batteries), video cable, operating instructions, carry case, software package, temperature test certificate, mini-SD interchangeable memory card (only V and LV models).	
	Optional interchangeable lenses	IC Standard and IC V Series: 38°, 28°, 6.4° (further lenses on request) IC LV Series: 48°, 12°, 28°	
	Optional accessories	Tripod mount bracket, power supply, 12V adapter for cigarette lighter, additional battery, Bluetooth expansion kit and Bluetooth headset (only V and LV models), software upgrade for thermographic video recordings and evaluations in real-time (only V and LV models), further software packages on request.	

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