VOLTCRAFT®

IR1000-50CAM IR THERMOMETER

GB OPERATING INSTRUCTIONS

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1. INTRODUCTION

Dear Customer,

In purchasing this Voltcraft® product, you have made a very good decision for which we would like to thank you.

Voltcraft® - In the field of measuring, charging and network technology, this name stands for high-quality products which perform superbly and which are created by experts whose concern is continuous innovation.

From the ambitious hobby electronics enthusiast to the professional user, products from the Voltcraft® brand family provide the optimum solution even for the most demanding tasks. And the remarkable feature is: we offer you the mature technology and reliable quality of our Voltcraft® products at an almost unbeatable price-performance ratio. In this way, we aim to establish a long, fruitful and successful co-operation with our customers.

We wish you a great deal of enjoyment with your new Voltcraft® product!

2. INTENDED USE

The infrared thermometer is a measuring device for non-contact temperature measurement. It determines the temperature based on the emitted infrared energy and the emissivity of an object. This type of measurement is very useful to measure objects that are hot, difficult to reach or moving. The device measures the surface temperature of an object. The temperature behind transparent surfaces such as glass or plastic cannot be measured. The temperature measuring range is between -50 °C and 1000 °C. A 3.7 V Li-ion, type 18500 rechargeable battery is required for power supply. In addition to contact-free infrared temperature measurement, the device may also be used for measurements with traditional temperature sensors (K type). There are build-in sensors in this product to measure ambient temperature and humidity. The product is also capable of capturing picture and video together with the measured values.

This product fulfils European and national requirements related to electromagnetic compatibility (EMC). CE conformity has been verified and the relevant statements and documents have been deposited at the manufacturer.

Unauthorised conversion and/or modification of the device are inadmissible because of safety and approval reasons (CE). Any usage other than described above is not permitted and can damage the product and lead to associated risks such as short-circuit, fire, electric shock, etc. Please read the operating instructions thoroughly and keep them for further reference.

Observe all safety instructions and information within this operating manual.

3. DELIVERY CONTENT

- Infrared thermometer
- Storage case
- 3.7 V Li-ion, type 18500 battery
- K-type wire sensor
- USB interface cable
- Tripod
- Power adaptor
- Operating instructions

4. FEATURES

- Dual targeting laser with focal point
- Integrated alarm function with high and low alarm values and visual as well as acoustic signalling.
- Saves maximum, minimum, and average temperatures as well as temperature differences during measurements
- Continuous measurement function
- Emissivity adjustable from 0.10 to 1.00
- Additional temperature measurement via type K contact sensor
- Picture and video capture function

5. SYMBOL EXPLANATION

An exclamation mark in a triangle indicates important instructions in this operating manual which absolutely have to be observed.

The symbol can be found when you are to be given tips and information on operation.

6. SAFETY INSTRUCTIONS

We do not assume liability for resulting damages to property or personal injury if the product has been abused in any way or damaged by improper use or failure to observe these operating instructions. The warranty/ guarantee will then expire! The icon with exclamation mark indicates important information in the operating instructions. Carefully read the whole operating instructions before operating the device, otherwise there is risk of danger.

Dear Customer, the following safety instructions are intended not only for the protection of your health but also for the protection of the device. Please read carefully through the following points:

Persons / Product

- The product is not a toy and should be kept out of reach of children and pets!
- On commercial premises, the accident prevention regulations of the Association of Industrial Professional Associations with respect to electrical systems and operating equipment must be observed.
- In schools, training centres, Hobby and DIY workshops, the handling of measuring appliances must be responsibly supervised by trained personnel.
- Be especially careful when dealing with voltages higher than 25 V AC or 35 V DC! Even at voltages as low as these, there is a danger of fatal electric shock if you touch electric conductors.
- When used in conjunction with other devices, observe the operating instructions and safety notices of connected devices.
- The product must not be subjected to heavy mechanical stress or intense vibration.
- The product must not be exposed to electromagnetic fields, extreme temperatures, direct sunlight or dampness.
- The device must not be exposed to humidity or liquids.
- Steam, dust, smoke and/or vapours can prevent accurate measurement by obstructing the thermometer's optics.
- The product should not be used immediately after it has been brought from an area of cold temperature to an area of warm temperature. Condensed water might destroy the product. Wait until the product adapts to the new ambient temperature before use.
- If there is reason to believe that safe operation is no longer possible, put the device out of operation and secure it against unintended operation. Safe operation is no longer possible if:
  - the product shows visible damages,
  - the product no longer works and
  - the product was stored under unfavourable conditions for a long period of time,
  - the product was subject to considerable transport stress.
- The manufacturer or supplier accepts no responsibility whatsoever for incorrect displays or the consequences which can arise from such incorrect displays.

Batteries

- Correct polarity must be observed while inserting the batteries.
- Batteries should be removed from the device if it is not used for a long period of time to avoid damage through leaking. Leaking or damaged batteries might cause acid burns when in contact with skin, therefore use suitable protective gloves to handle corrupted batteries.
- Batteries must be kept out of reach of children. Do not leave the battery lying around, as there is risk, that children or pets swallow it.
- All the batteries should be replaced at the same time. Mixing old and new batteries in the device can lead to battery leakage and device damage.
- Batteries must not be dismantled, short-circuited or thrown into fire. Never recharge non-rechargeable batteries. There is a risk of explosion!

Laser safety

- Never look into the laser beam and never point it at people or animals. Laser radiation can cause damage to eyes or skin.
- Lasers should never be used by children. They are not toys.
- This product is equipped with a class 2 laser according to EN 60 825-1. Never open the device.
- Any adjustment or service work is only to be carried out by qualified personnel who are familiar with the risks involved. Improperly made adjustments may result in hazardous laser radiation.
- During operation of the device, the laser has to be directed in such a way that no person is located within the range of projection and that unwanted reflected rays (e.g. due to reflecting objects) do not get into the range of any person.
- If possible, restrict the range of radiation by using screens or partitions.
- Mark the range of the laser by cordoning off or using warning signs.
- Best direct the laser in such a way that it does not run at eye-height
- Never open the device. Any adjustment or service work is only to be carried out by qualified personnel who are familiar with the risks involved. Improperly made adjustments may result in hazardous laser radiation.
- Included in the delivery are reference signs for the laser in different languages. In case the sign on the laser is not written in the language of your country, please fix the respective sign onto the laser.

Miscellaneous

- Maintenance, modifications and repairs are to be performed exclusively by an expert or at a qualified shop.
- If you have queries about handling the device, that are not answered in this operating instruction, our technical support is available under the following address and telephone number: Voltcraft®, 92242 Hirschau, Lindenweg 15, Germany, phone 0180 / 586 582 7.

7. OPERATING ELEMENTS

1. Protective cover
2. LC display
3. Button video / down arrow
4. Button ESC / power
5. Button photo / up arrow
6. Button ENTER
7. Trigger
8. Camera lens
9. Laser
10. K-type thermocouple socket
11. USB socket
12. Micro SD card socket
13. Battery
14. Tripod thread

8. CHARGING AND BATTERY REPLACEMENT

Charging the battery

1. Connect the mini-USB plug of the USB cable to the USB socket (11) of the device.
2. Connect the USB type A plug of the USB cable to a vacant USB port on your computer, or a USB power supply of 5 V, 500 mA.
3. The device will be turned on. It will be turned off again according to the auto power off setting. (See the chapter “Configuration”)

Replacing the battery

1. Make sure the device is turned off before replacing the battery.
2. Open the battery compartment on the handel.
3. Remove the battery. Replace with a battery of the same type (3.7 V Li-ion, type 18500), observing the correct polarity.
4. Close the battery compartment.

9. INSERTING A MEMORY CARD

If you would like to save the data file onto a micro SD card, insert a micro SD into the memory card slot (12). Otherwise, you can still save your files in the internal memory.

10. TURNING THE DEVICE ON / OFF

- Press and hold the ESC / power (4) button for about three seconds to turn the device on. A beep sound will be heard and the screen lights up. You will see the main menu after booting up.
- Press and hold the ESC / power (4) button for about three seconds to turn the device off.

11. CONFIGURATION

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option “SETTINGS” and confirm by pressing the button ENTER (6).
2. You will now enter the sub-menu, select your desired item and press the button ENTER (6) to confirm. When operating this device, you can always press the button ESC / power (4) to go back to the previous menu.

“DATE/TIME”	**Set the date and time of the device** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to change the value and press the button ENTER (6) to move to the next value. 2. Press the button ESC / power (4) to save and go back to the previous menu.
“UNITS (ºC/ ºF)”	**Set the temperature unit** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired unit between “ºC” and “ºF” 2. Press the button ESC / power (4) to save and go back to the previous menu.
“LANGUAGE”	**Set the interface language** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired language of “ENGLISH” or “GERMAN”. 2. Press the button ESC / power (4) to save and go back to the previous menu.
“FONT COLOUR”	**Set the font colour** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired font colour between: - ORANGE - GREEN - BLACK - BLUE - GOLD - PURPLE 2. Press the button ESC / power (4) to save and go back to the previous menu.
“CURSOR”	**Select your cursor** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired cursor, either “OFF” (no cursor), “CROSS” or “CIRCLE”. 2. Press the button ESC / power (4) to save and go back to the previous menu.

“BACKLIGHT”	**Adjust the brightness level of the backlight** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired brightness level from 30 % to 100 %. 2. Press the button ESC / power (4) to save and go back to the previous menu.
“AUTO POWER OFF”	**Set the auto power off period** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired auto power off period: - Disabled (the device will not be powered off) - 3 MIN (the device will be powered off after being idle for 3 mins.) - 15 MIN (the device will be powered off after being idle for 15 mins.) - 60 MIN (the device will be powered off after being idle for 60 mins.) 2. Press the button ESC / power (4) to save and go back to the previous menu.
“SCREEN TIMEOUT”	**Set the screen time out period** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired screen time-out period: - Disabled (the device will not be powered off) - 3 MIN (the screen will be powered off after being idle for 30 s.) - 15 MIN (the screen will be powered off after being idle for 1 min.) - 60 MIN (the screen will be powered off after being idle for 2 mins.) 2. Press the button ESC / power (4) to save and go back to the previous menu.
“KEY PRESS ALERT”	**Enable or disable the key tone when press the key** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired function between “ENABLE” and “DISABLE”. 2. Press the button ESC / power (4) to save and go back to the previous menu.
“MEMORY STATUS”	**Select the storage medium** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select your desired storage medium between “DEVICE MEMORY” and “SD CARD” 2. Pictures, videos and data logs will be saved in the selected storage medium. The files can be extracted via the USB cable. 3. Capacity of the storage medium is also shown in the display. - “TOTAL” - “USED” - “FREE” 4. Press the button ESC / power (4) to save and go back to the previous menu.

"FACTORY SETTING"	**Restore the device** 1. Use the button photo / up arrow (5) and the button video / down arrow (3) to set this function with "YES" and "NO" 2. Press the button ESC / power (4) to save and go back to the previous menu. The setting will be restored to the factory default. ➔ *The files in the internal memory and the micro SD card will not be affected.*

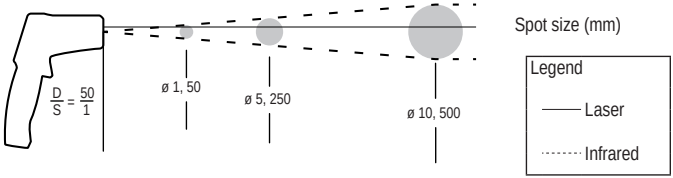
12. MEASURING TEMPERATURE

Operating principle

IR thermometers measure the surface temperature of an object. The sensor on the device records the heat radiation emitted, reflected and transmitted from the object, and converts this information into a temperature value. The emission level is a value used to describe the energy radiation characteristics of a material. The higher the value, the more capable the material is of emitting radiation. Many organic materials and surfaces have an emission level of approx. 0.95. Metallic surfaces or shiny materials have a lower emission level and therefore return inaccurate measured values.

Measurement distance / measurement surface area ratio (D/S)

- To achieve accurate measurements, the target must be larger than the thermometer's measuring area. The measured temperature is the average temperature of the area measured.
- The smaller the target, the smaller the measurement distance between thermometer and target object has to be.
- The distance to target / size of IR focal spot ratio is 50:1. With a distance of 50 cm to the target, the size of the IR focal spot is thus 1 cm.



1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option "IR MEASURE" and confirm by pressing the button ENTER (6). IR shows on the screen indicating it is in the "IR MEASURE" mode.
2. Press the button "ENTER" (6) to enter the sub-menu for setting the parameters of this mode.

Noted that the setting of the "IR CAM" mode is shared with the "IR MEASURE" mode, the "DEWPOINT" mode and the "DATALOG" mode.
For optimal response time (150 ms), use the "IR MEASURE" mode.

"EMISSIVITY"	**Set the emissivity of the target object** • Select your desired preset material type: - "CONCRETE" - "GLASS" - "HUMAN SKIN" - "ICE / WATER" - "PLASTIC" - "WOOD" or enter your customized ε. Select ε and press the button "ENTER" (6), then use the button photo / up arrow (5) and the button video / down arrow (3) to adjust the value. • Press the button ESC / power (4) to save and go back to the previous menu.
"ALARM HIGH" "ALARM LOW"	**Set the alarm triggering temperature** Alarm will be triggered when the temperature exceed the range. • Select ENABLE to enable the function, then press the button "ENTER" (6) and adjust the value by using the button photo / up arrow (5) and the button video / down arrow (3). • Or select DISABLE to disable the function. • Press the button ESC / power (4) to save and go back to the previous menu.
"LASER"	**Laser** • Select ENABLE to enable the function or DISABLE to disable the function. • Press the button ESC / power (4) to save and go back to the previous menu.
"AUTO MODE"	**Auto trigger** When the auto mode is enabled, the IR measuring beam is triggered continuously. The function will be disabled when you leave the IR MEASURE mode Therefore, you need to enable it again if you re-enter the IR MEASURE mode. • Select ENABLE to enable the function or DISABLE to disable the function. • Press the button ESC / power (4) to save and go back to the previous menu.

“MAX / MIN”	Enable the display of the values • Select ON to show the respective value on screen during measurement. • Select OFF to hide the respective value. • Press the button ESC / power (4) to save and go back to the previous menu.
“AVERAGE / DIF”	
“AMBIENT TEMP / % RH”	
“DEWPOINT / WETBULB”	
“TYPE-K”	

3. Aim at the target object, and press and hold the button trigger (7) to measure the temperature at the target object. According to your setting, the following information will be shown on the display:

Measured by the sensor in the device	Measured by the IR temperature sensor
• AT (ambient temperature) • RH % (ambient humidity)	• Target point temperature (in the middle of the screen)
Calculated information based on the measurement from the sensor in the device	Calculated information based on the measurement from the IR temperature sensor
• DP (dew point temperature) • WB (wet bulb temperature)	• DIF (differential temperature) • MAX (maximum temperature) • MIN (minimum temperature) • AVG (average temperature)
Measured by the type-K sensor	
• TK (Type-K sensor temperature)	

The measuring session of the IR sensor will be ended when the button trigger (7) is released. A new measuring session will be started when you press the button trigger again. That is to say, the MAX, MIN, AVG and DIF information will be cleared when you press the button trigger (7) again.

The ruler at the bottom of the screen indicates the measuring range of the current measuring session. The indicator shows the current temperature or the target object.

Symbols on screen

The IR measurement is stopped.

The IR measurement is operating.

The “ALARM LOW” is active.

The “ALARM HIGH” is active.

Laser has been emitted.

The target object temperature falls below the “ALARM LOW” setting.

The target object temperature exceeds the “ALARM HIGH” setting.

Type-K thermal couple measuring

1. Insert the K-type wire sensor into the K-type socket (10) of the device.
2. Enable the display of “TYPE-K” in the sub-menu. (See the previous session.) Note that the TK reading will not be shown if the “TYPE-K” function is disabled or if the K-type wire sensor is not connected.
3. Place the end of the K-type wire at the desired place.

13. TAKING PICTURES / VIDEO WHILE MEASURING TEMPERATURE

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option “IR CAM” and confirm by pressing the button ENTER (6). Then you will first enter the camera mode. A symbol  will be shown on the display.
2. Press the button “ENTER” (6) to enter the sub-menu for setting the parameters of this mode. The measuring speed of “IR CAM” mode is slower than the “IR MEASURE” mode.
3. Aim at your target object and you can watch it on the display.
4. Press the button trigger (7) to measure the temperature of the target object.

Taking pictures

1. In camera mode, press the button photo / up arrow (5) to take a picture. If no measurement has been taken in the session, the picture will not contain any measurement. If a measurement has been taken, the latest measurement will be included in the picture.
2. A preview will shows up, press the button photo / up arrow (5) to select the “SAVE”, press the button video / down arrow (3) to select “CANCEL”.

Taking videos

1. Press the button video / down arrow (3) to switch to video mode. A symbol  shows on the display.
2. Press the button video / down arrow (3) again to select “START” and start recording.
3. Press the button video / down arrow (3) again to select “STOP” and stop recording. You will see the text “SAVING FILE...” when you stop recording.
4. Press the button ESC / power (4) to return to camera mode.

14. MEASURING DEW POINT TEMPERATURE

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option “DEWPOINT” and confirm by pressing the button ENTER (6). Then you will enter the “DEWPOINT” mode. A symbol DP shows on the disyplay.
2. Aim the target object, press and hold the button trigger (7) to measure the temperature at the target object. Same as in “IR MEASURE” mode, the selected information will show.

   The colour bar at the bottom of the screen indicates the possibility of mould.

15. DATA LOGGING

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option “DATALOG” and confirm by pressing the button ENTER (6).
2. Set the parameters before using the function.
3. Use the button photo / up arrow (5) and the button video / down arrow (3) to move between the parameters, select one and confirm by pressing the button ENTER.
4. Use the button photo / up arrow (5) and the button video / down arrow (3) to adjust the value, confirm by pressing the button ENTER.
5. Start data logging by pressing the button trigger (7). The device will measure and record the target object’s temperature. The data will be saved automatically.

16. VIEW THE STORED PICTURES, VIDEOS AND LOGS

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the option “GALLERY” and confirm by pressing the button ENTER (6).
2. Use the button photo / up arrow (5) and the button video / down arrow (3) to select between “PICTURE”, “VIDEO” and “LOGS”.

Pictures

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the desired picture.
2. Press the button ENTER (6) to show the selected picture.
3. Use the button photo / up arrow (5) and the button video / down arrow (3) to view the previous / next picture.
4. Press the button ENTER (6) to delete the picture, you will be asked to CONFIRM by pressing the button photo / up arrow (5), or press the button video / down arrow (3) to cancel (NO).

Videos

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the desired video.
2. Press the button ENTER (6) to play the selected video.
3. Press the button ENTER (6) to delete the video, you will be asked to CONFIRM by pressing the button photo / up arrow (5), or press the button video / down arrow (3) to cancel (NO).

Logs

1. Use the button photo / up arrow (5) and the button video / down arrow (3) to select the desired log.
2. Press the button ENTER (6) to show the selected log.
3. Use the button photo / up arrow (5) and the button video / down arrow (3) to scroll across the x-axis of the chart.
4. Press the button ENTER (6) to delete the log, you will be asked to CONFIRM by pressing the button photo / up arrow (5), or press the button video / down arrow (3) to cancel (NO).

17. USB CONNECTION

The picture, video and log files can be extracted via USB.

1. Connect the mini-USB plug of the USB cable to the USB socket (11) of the device.
2. Connect the USB type A plug of the USB cable to a vacant USB port on your computer.
3. The device will be recognized as a mass storage device, then you can extract the files to your computer.

18. RESET THE DEVICE

If the device stalls, you can reset the device by using a pin to push the pin hole switch located between the USB port and the K-Type socket.

19. TRIPOD MOUNTING

Screw the tripod into the tripod socket on the bottom of the device in a clockwise direction to fasten it. Unmount the tripod by screwing it in an anti-clockwise direction.

20. MAINTENANCE AND CLEANING

The device is maintenance-free apart from the need to replace the batteries and cleaning it once in a while.

Lens cleaning

- Blow off loose particles using clean compressed air and then brush the remaining debris away with a fine lens brush.
- Wipe the surface with a lens cleaning cloth or a clean, soft, lint-free cloth.
- In the case of fingerprints or any other grease formation, the cloth may be moistened with water or lens cleaning fluid.
- Do not use acid, alcohol, or other solvents or harsh, linty cloth to clean the lens. Avoid and excessive pressure.

Cleaning the exterior

Use a clean, lint-free, antistatic and slightly damp cloth to clean the device. Do not use any abrasive or chemical agents or detergents containing solvents.

21. DISPOSAL

General

In order to preserve, protect and improve the quality of environment, protect human health and utilise natural resources prudently and rationally, the user should return unserviceable product to relevant facilities in accordance with statutory regulations.
The crossed-out wheeled bin indicates the product needs to be disposed separately and not as municipal waste.

Batteries / rechargeable batteries

The user is legally obliged **(battery regulation)** to return used batteries and rechargeable batteries. Disposing used batteries in the household waste is prohibited! Batteries/ rechargeable batteries containing hazardous substances are marked with the crossed-out wheeled bin. The symbol indicates that the product is forbidden to be disposed via the domestic refuse. The chemical symbols for the respective hazardous substances are Cd = Cadmium, Hg = Mercury, Pb = Lead.
You can return used batteries/ rechargeable batteries free of charge to any collecting point of your local authority, our stores or where batteries/ rechargeable batteries are sold.
Consequently you comply with your legal obligations and contribute to environmental protection!

22. TECHNICAL DATA

General

Operating voltage:	3.7 V/DC
Display size:	55.88 mm (2.2")
Internal memory:	49 MB
Memory card support:	micro SD, max. 8 GB
Picture format:	JPG, 640 x 480 pixels
Video format:	3GP, 320 x240, 9.5 fps
Laser wavelength:	630 to 670 nm
Laser output:	< 1 mW
Laser class:	II
Operating temperature:	0 to +50 ºC (+32 to +122 ºF)
Operating humidity:	-10 to +60 ºC (+14 to +140 ºF)
Storage temperature:	10 to 90 %
Dimensions (W x H x D):	62 x 205 x 155 mm
Weight:	410 g

Power supply

Input voltage:	100 - 240 V/AC, 60/50 Hz
Input current:	max. 0.13 A
Output voltage:	5 V/DC
Output current:	max 1 A

IR measurement

Response time ("IR MEASURE" mode):	150 ms
Spectral response:	8 to 14 µm
Emissivity:	0.1 to 1.0
Distance / surface ratio (D/S):	50:1
Measurement range:	-50 to +1000 ºC (-58 to +1832 ºF)

Measuring range	Accuracy
-50 to +20 °C (-58 to -4 °F)	±5 °C (±9 °F)
+20 to +500°C (-4 to 932 °F)	±1.5 % rdg ±1.5 °C (±3 °F)
500 to +1000°C (932 to 1832 °F)	±2 % rdg

Measuring range	Repeatability
-50 to +20 °C (-58 to 68°F)	±1.5 ºC (2.7 ºF)
+20 to +1000 ºC (68 to 1832 ºF)	±0.5 % rdg or ±0.5 ºC (0.9 ºF)

Display value	Resolution
<1000	0.1 ºC (0.1 ºF)
>1000	1 ºC (0.1 ºF)

Type-K measurement

Measurement range:	-50 to +1370 ºC (-58 to +2498 ºF)

The included K-type temperature sensor allows you to directly measure temperatures from -20 to +250 ºC. The IR1000-50CAM's total measurement range (-50 to +1370 ºC) can be utilised with optional K-type temperature sensors.

Measuring range	Accuracy
-50 to 0 °C (-58 to 32 °F)	±3.5 °C (±6.5 °F)
0 to 1370 (32 to 2498 °F)	±1 % rdg ±2 °C (±4 °F)

Measuring range	Resolution
<1000	0.1 ºC (0.1 ºF)
>1000	0.1 ºC (0.1 ºF)

Air temperature (by internal sensor)

Measurement range:	0 to +50 ºC (+32 to +122 ºF)

Measuring range	Accuracy
+10 to + 40 ºC	±1 ºC (1.8 ºF)
others	±1.5 ºC (3 ºF)

Humidity

Measurement range:	0 - 100 % RH

Measuring range	Accuracy
0 to 40 % RH and 60 to 80% RH	± 3.5 % RH
40 to 60 % RH	± 3 % RH
80 to 100 %	± 5 % RH

Dew point temperature
(calculated base on measurements from internal sensor)

Measurement range:	0 to +50 ºC (+32 to +122 ºF) (air temperature)

Measuring range	Accuracy
+10 to + 40 ºC	±1 ºC (1.8 ºF)
others	±1.5 ºC (3 ºF)

Measurement tolerances

Accuracy of measurement in ± (% of the reading (= rdg)). The accuracy is valid for one (1) year at a temperature of +23°C ± 5°C, and at a relative humidity of less than 80 %, non-condensing.

Surface emissivity

Measured surface	Emissivity
Asphalt	0.90 to 0.98
Brick	0.93 to 0.96
Cement	0.96
Ceramic	0.90 to 0.94
Charcoal (powder)	0.96
Chromium oxides	0.81
Cloth (black)	0.98
Concrete	0.94
Copper oxides	0.78
Glass	0.90 to 0.95
Human skin	0.98
Ice	0.96 to 0.98
Iron oxide	0.78 to 0.82

Measured surface	Emissivity
Lacquer	0.80 to 0.95
Lacquer (matt)	0.97
Lather	0.75 to 0.80
Marble	0.94
Mortar	0.89 to 0.91
Paper	0.70 to 0.94
Plaster	0.80 to 0.90
Plastic	0.85 to 0.95
Rubber (black)	0.94
Sand	0.90
Soil	0.92 to 0.96
Textiles	0.90
Water	0.92 to 0.96

The emissivity values shown in the above table are approximate. Several parameters, e.g. geometry, surface quality, may affect the emissivity of an object.