

**BP21**

**EN**

**OPERATING MANUAL**  
PYROMETER






 **TROTEC**  
AT WORK.

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**Notes regarding the operating manual**

**Symbols**

-  **Danger!**  
Warns of a hazard which can lead to injuries.
-  **Risk from laser radiation!**  
Warns of injury risk from laser radiation.
-  **Caution!**  
Warns of a hazard which can lead to damage to property.

The current version of the operating manual can be found at: [www.trotec.de](http://www.trotec.de)

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The only party responsible for determining measured results to be valid, drawing conclusions and deriving actions is the user! TROTEC® accepts no claims of warranty for the correctness of the determined measured values or measured results. Further, TROTEC® accepts no liability whatsoever for possible mistakes or damage which have been caused by utilising the determined measured results. © TROTEC®

**Information about the device**

**Functional description**

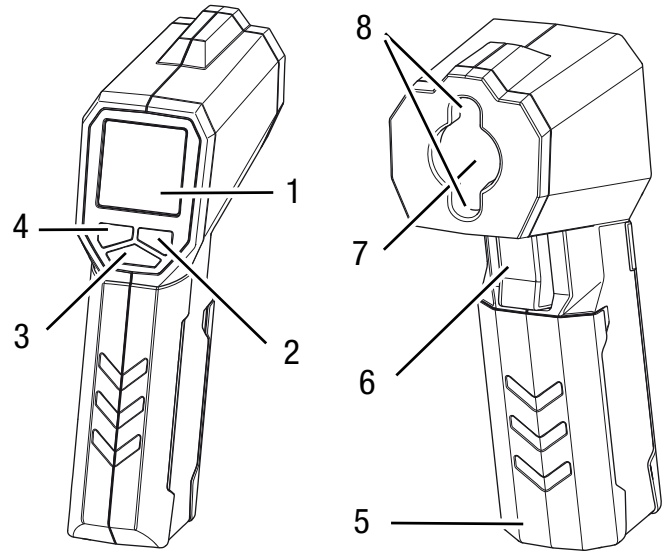
The pyrometer BP21 uses an infrared sensor to measure surface temperatures without contact. An integrated dual laser pointer can be switched on for the precise determination of the measuring spot diameter. Additionally, the degree of emission of the material to be measured can be set. The device can show either the maximum or minimum value of the measurement.

The device further features an alarm function. When exceeding or falling below the specified values, the device emits an acoustic signal.

The display can be illuminated as needed.

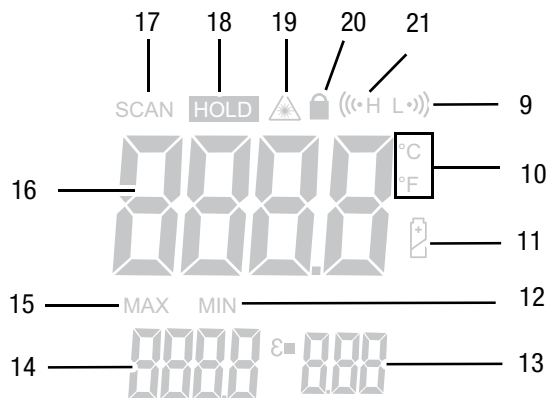
When not in use, an automatic switch-off saves the battery.

**Device depiction**



No.	Operating element
1	Display
2	Lamp button
3	Mode key
4	Laser button
5	Battery compartment with cover
6	Measurement button
7	Infrared sensor
8	Dual laser pointer

## Display



No.	Display element
9	Indication of the lower alarm threshold
10	Indication of the temperature unit
11	Battery indication
12	MIN indication
13	Indication of the degree of emission
14	MAX MIN temperature display
15	MAX indication
16	Measurement value display top
17	SCAN indication
18	HOLD indication
19	Laser indication
20	Indication for continuous measurement
21	Indication of the upper alarm threshold

## Technical data

Model	BP21
Weight	185 g
Dimensions H x W x D	160 mm x 53 mm x 45.6 mm
Measuring range	-35 °C to 800 °C (-31 °F to 1472 °F)
Accuracy	±2 °C (±4 °F) or 2.0 % of the measured value (the higher value applies)
Measuring range resolution	0.1 °C / °F
Operating temperature	0 to 50 °C (32 °F to 122 °F)
Relative humidity during operation	Max. 80 % relative humidity
Storage conditions	-20 °C to 60 °C
Laser output	< 1 mW (630–670 nm)
Laser	Class II, 630 to 670 nm < 1 mW
Degree of emission	Adjustable
Distance to measuring spot diameter ratio	12:1
Spectral sensitivity	8~14 µm
Reaction time	< 1 s
Power supply	9 V battery
Switch off	After approx. 8 seconds of non-use

## Scope of delivery

- 1 x Pyrometer BP21
- 1 x 9 V battery
- 1 x Device bag
- 1 x Getting started guide

## Safety

**Carefully read the operating manual before using the device and keep it within reach!**

- Do not use the device in atmospheres containing oil, sulphur, chlorine or salt.
- Protect the device from permanent direct sunlight.
- Avoid looking directly into the laser beam.
- Never point the laser beam at people or animals.
- Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in legible condition.
- Observe the storage and operating conditions (see chapter Technical data).

## Intended use

This device is exclusively intended for measuring temperature with an infrared sensor in the measuring range specified in the technical data. People who use this device must have read and understood the operating manual, especially the Safety chapter.

## Improper use

The device must not be used in potentially explosive atmospheres. It must not be pointed at people. TROTEC® accepts no liability for damages resulting from improper use. In such a case, entitlements to a warranty are forfeited.

## Personnel qualifications

People who use this device must:

- have read and understood the operating manual, especially the Safety chapter.
- be aware of the dangers that occur when working with laser measuring devices.

## Residual risks



### Risk from laser radiation!

Class 2 laser radiation.

Lasers of class 2 only radiate in the visible range and during continuous wave operation (lasting beam) no more than 1 milliwatt (mW) of output will be emitted. Looking directly into the laser beam for a longer period of time (more than 0.25 seconds) can cause damage to the retina.

Avoid looking directly into the laser beam. Never look into the laser beam using optical aides. Do not suppress the winking reflex when looking into the laser beam unintentionally. Never point the laser beam at people or animals.



### Danger!

Keep a sufficient distance away from sources of heat.



### Danger!

Do not leave the packaging lying around. Children may use it as a dangerous toy.



### Danger!

The device is not a toy and does not belong in the hands of children.



### Danger!

Dangers can occur at the device when it is used by untrained people in an unprofessional or improper way. Observe the personnel qualifications.



### Caution!

To prevent damages to the device, do not expose it to extreme temperatures, extreme humidity or moisture.



### Caution!

Do not use abrasive cleaners or solvents to clean the device.

## Transport and storage

### Transport

Use the supplied device bag to transport the device.

### Storage

When the device is not being used, observe the following storage conditions:

- Dry,
- Protected from dust and direct sunlight.
- With a plastic cover to protect it from invasive dust, if necessary.
- The storage temperature is the same as the range given in the chapter Technical data.
- When storing the device for a long time, remove the batteries.
- Preferably use the supplied device bag to store the device.

## Operation

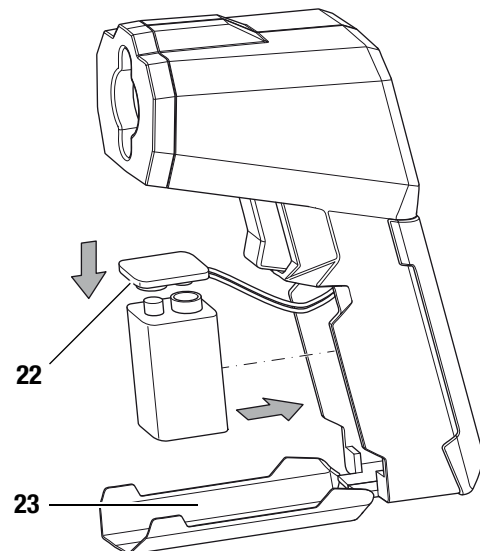
### Inserting the battery

- Insert the supplied battery before first use.



### Caution!

Make certain that the surface of the device is dry and the device is switched off.



1. Open the cover of the battery compartment (23).
2. Use the battery clip (22) to connect the new battery with correct polarity.
3. Close the cover of the battery compartment (23).

## Carrying out a measurement

### Note:

Note that moving from a cold area to a warm area can lead to condensation forming on the device's circuit board. This physical and unavoidable effect can falsify the measurement. In this case, the display shows either no measured values or they are incorrect. Wait a few minutes until the device has become adjusted to the changed conditions before carrying out a measurement.

- Ensure that the surface to be measured is free of dust, dirt or similar substances.
  - To be able to gain exact measurement results on surfaces which reflect heavily, stick matt masking tape to the surface or apply matt black paint with a very high and known degree of emission.
  - Note the 12:1 ratio of the distance to the measuring spot size. For accurate measurements the measuring object should be at least twice as large as the measuring spot.
1. Point the device at the object to be measured.
  2. Press the Measurement button (6).
    - Hold onto the Measurement button (6) if you want to perform a prolonged measurement.
    - The device turns on and carries out a measurement. The SCAN indication (17) appears on the display.
    - The current measured value is indicated.
  3. Let go of the Measurement button (6) again.
    - The device stops measuring. The HOLD symbol (18) appears in the display. Depending on the setting of the device, either the maximum or minimum value (14) of the last measurement is shown in addition.

The device switches off after approx. 8 seconds without being used.

## Switching the laser pointer on or off

Ex works the laser pointer is switched off.



### Danger due to laser radiation!

Please observe that with a switched-on laser the laser pointer will go on as soon as you press the Measurement button (6) or activate continuous measurement.

1. Press the Laser button (4).
  - The Laser pointer on symbol (19) appears on the display.
  - The laser pointer is switched on.
2. Press the Laser button (4) again.
  - The Laser pointer on symbol (19) is no longer displayed.
  - The laser pointer is switched off.

The device memorizes the selected setting when switching off.

## Switching the display illumination on or off

Ex works the display illumination is switched off.

1. Press the Lamp button (2).
  - The display illumination will be switched on.
2. Press the Lamp button (2) again.
  - The display illumination will be switched off.

The device memorizes the selected setting when switching off.

## Further setting options

By use of the Mode key (3) you can access the extended choice of settings. Alarm thresholds and temperature units can be selected here, for instance.

1. Press the Mode key (3) several times to reach the desired setting:

Number	Menu option
1 x	Setting the degree of emission
2 x	Setting the temperature unit
3 x	Activating maximum or minimum value
4 x	Activating continuous measurement
5 x	Enabling/disabling the upper alarm threshold
6 x	Entering the upper alarm threshold
7 x	Enabling/disabling the lower alarm threshold
8 x	Entering the lower alarm threshold

You can adjust the respectively selected setting by use of the Laser button (4) (up) or the Lamp button (2) (down).

### Note:

With activated continuous measurement it is not possible to switch the background illumination or the laser beam on and off. Select the corresponding setting before activating continuous measurement.

Example: Setting the degree of emission:

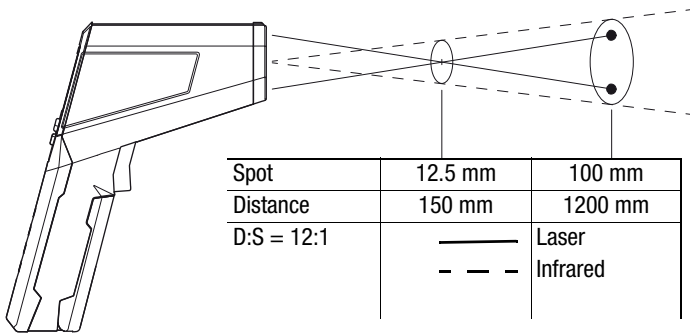
1. Press the Mode key (3) once.
  - Extended setting mode will be started.
  - The Degree of emission indication (13) flashes.
  - The value can be adjusted upwards using the Laser button (4).
  - The value can be adjusted downwards using the Lamp button (2).
  - The value range is between 1.00 and 0.10.

### Measuring principle

The device measures the temperature by means of an infrared sensor. Important factors playing a role in the temperature measurement are the measuring spot diameter and the degree of emission.

### Measuring spot

Observe the ratio of the distance to the measuring spot diameter. The larger the distance to the object, the larger the measuring spot diameter and hence, the less precise the measured result, for the device calculates an average temperature from all the temperatures in the measuring spot.



### Degree of emission

The degree of emission is used to describe the energy radiation characteristics of a material.

Most organic materials have a degree of emission of 0.95. Metals or shiny materials come with a much lower value.

A material's degree of emission depends on various factors such as the material composition, its surface condition and temperature. (In theory,) It can be between 0.1 and 1.

As a rule of thumb we can assume: When a material is rather dark and its surface texture matt, it probably has a high degree of emission. The brighter and smoother the surface of a material, the lower will be its degree of emission, presumably. The higher the degree of emission of the surface to be measured, the better it is suited for non-contact temperature measurement by use of a pyrometer or thermal imaging camera, since falsifying temperature reflections become negligible. Nevertheless, entering a degree of emission as appropriate as possible is indispensable for a precise measurement.

### Degree of emission table

Material	Degree of emission
Aluminium, roughened	0.1 to 0.3
Aluminium, alloy A3003, oxidized	0.3
Aluminium, oxidized	0.2 to 0.4
Asbestos	0.92 to 0.95
Tarmac	0.92 to 0.95
Basalt	0.7
Concrete	0.92 to 0.95
Bitumen	0.98 to 1.00
Lead, oxidized	0.2 to 0.6
Lead, rough	0.4

Material	Degree of emission
Roofing felt	0.95
Ice	0.98
Iron (forged), blunt	0.9
Iron, oxidized	0.5 to 0.9
Iron, rusted	0.5 to 0.7
Enamel varnish, black	0.95
Earth	0.92 to 0.96
Paint (not alkaline)	0.90 to 0.95
Paint (non-metal)	0.95
Gypsum	0.6 to 0.95
Glass, pane	0.85 to 0.95
Rubber	0.92 to 0.95
Cast iron, molten	0.2 to 0.3
Cast iron, not oxidized	0.2
Skin	0.98
Haynes alloy	0.3 to 0.8
Radiator enamel	0.95
Timber (natural)	0.9 to 0.95
Inconel, electro-polished	0.15
Inconel, oxidized	0.7 to 0.95
Inconel, sand-blasted	0.3 to 0.6
Limestone	0.95 to 0.98
Carborundum	0.9
Ceramics	0.88 to 0.95
Gravel	0.95
Carbon, graphite	0.7 to 0.85
Carbon, not oxidized	0.8 to 0.9
Plastic, non-transparent	0.95
Copper, oxidized	0.4 to 0.8
Varnish	0.80 to 0.95
Marble	0.90 to 0.95
Brass, highly polished	0.3
Brass, oxidized	0.5
Molybdenum, oxidized	0.2 to 0.6
Nickel, oxidized	0.2 to 0.5
Paper (any colour)	0.9
Plastic	0.85 to 0.95
Plaster	0.90 to 0.95
Sand	0.9
Snow	0.9
Steel, heavy plate	0.4 to 0.6
Steel, cold-rolled	0.7 to 0.9
Steel, oxidized	0.7 to 0.9
Steel, polished sheet metal	0.1
Steel, stainless	0.1 to 0.8
Cloth	0.95
Wallpaper (non-metal)	0.95
Textiles (non-metal)	0.95
Titanium, oxidized	0.5 to 0.6
Clay	0.90 to 0.95
Water	0.93
Cement	0.90 to 0.96
Brick (rough)	0.90 to 0.95
Zinc, oxidized	0.1

## Maintenance and repair

### Battery change

The battery is to be changed when the battery indication (11) lights up in the display or the device can no longer be switched on. See Inserting the battery on page 3.

### Cleaning

Clean the device with a soft, damp and lint-free cloth. Ensure that no moisture enters the housing. Do not use any sprays, solvents, alcohol-based cleaning agents or abrasive cleaners. Only use clean water to moisten the cloth.

### Repair

Do not modify the device. Never open the device housing or install any spare parts. For repairs or device testing, contact the manufacturer.

## Disposal



In the European Union, electronic equipment must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2002/96/EC of the European Parliament and Council of 27th January 2003 concerning old electrical and electronic equipment. After the end of its use, please dispose of this device in a manner appropriate to the relevant legal requirements.

## Declaration of conformity

in accordance with the EC Low Voltage Directive 2006/95/EC and the EC Directive 2004/108/EC about electromagnetic compatibility.

Herewith, we declare that the pyrometer BP21 was developed, constructed and produced in compliance with the named EC directives.

The  $\text{C} \in$  marking is found on the rear of the device.

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