**EN**

**OPERATING MANUAL**
PYROMETER

> TROTEC

# TROTEC

## Table of contents

## Notes regarding the operating manual

### Symbols

**Warning of electrical voltage**
This symbol indicates dangers to the life and health of persons due to electrical voltage.

**Warning of laser radiation**
This symbol indicates dangers to the health of persons due to laser radiation.

**Warning**
This signal word indicates a hazard with an average risk level which, if not avoided, can result in serious injury or death.

**Caution**
This signal word indicates a hazard with a low risk level which, if not avoided, can result in minor or moderate injury.

**Note**
This signal word indicates important information (e.g. material damage), but does not indicate hazards.

**Info**
Information marked with this symbol helps you to carry out your tasks quickly and safely.

**Follow the manual**
Information marked with this symbol indicates that the operating manual must be observed.

You can download the current version of the operating manual and the EU declaration of conformity via the following link:

TP7

https://hub.trotec.com/?id=42338

## Safety

**Read this manual carefully before starting or using the device. Always store the manual in the immediate vicinity of the device or its site of use.**

**Warning**
**Read all safety warnings and all instructions.**
Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury.
**Save all warnings and instructions for future reference.**
This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

- Do not use the device in potentially explosive rooms or areas and do not install it there.
- Do not use the device in aggressive atmosphere.
- Do not immerse the device in water. Do not allow liquids to penetrate into the device.
- The device may only be used in dry surroundings and must not be used in the rain or at a relative humidity exceeding the operating conditions.
- Protect the device from permanent direct sunlight.
- Do not expose the device to strong vibrations.
- Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in legible condition.
- Do not open the device.
- Avoid looking directly into the laser beam.
- Never point the laser beam at people or animals.
- Observe the storage and operating conditions as given in the Technical data chapter.

## Intended use

This device is exclusively intended for measuring temperature by means of 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.

To use the device for its intended use, only use accessories and spare parts which have been approved by Trotec.

## Improper use

The device must not be pointed at people. Do not use the device in potentially explosive atmospheres, for measurements in liquids or at live parts. Trotec accepts no liability for damages resulting from improper use. In such a case, any warranty claims will be voided. Any unauthorised modifications, alterations or structural changes to the device are forbidden.

## Personnel qualifications

People who use this device must:
- be aware of the dangers that occur when working with laser measuring devices.
- have read and understood the operating manual, especially the Safety chapter.

## Residual risks

**Warning of laser radiation**
**Laser class 2, P max.: < 1 mW, λ: 400-700 nm, EN 60825-1:2014**
Do not look directly into the laser beam or the opening from which it emerges.
Never point the laser beam at people, animals or reflective surfaces. Even brief eye contact can lead to eye damage.
Examining the laser output aperture by use of optical instruments (e.g. magnifying glass, magnifiers and the like) entails the risk of eye damage.
When working with a laser of class 2, observe the national regulations on wearing eye protection.

**Warning**
Risk of suffocation!
Do not leave the packaging lying around. Children may use it as a dangerous toy.

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

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

**Caution**
Keep a sufficient distance from heat sources.

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

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

## Information about the device

### Device description

The pyrometer TP7 uses an infrared sensor to measure surface temperatures without contact. An integrated multi-laser pointer serves for the determination of the measuring spot.

You can set the emission ratio of the material to be measured so as to achieve a more precise measurement result.

For the temperature measurement the device allows you to set freely definable thresholds. Exceeding or falling below these preselected thresholds is indicated by an acoustic alarm function and visually by a changed display colour.

The display can be illuminated as needed. When not in use, an automatic switch-off saves the battery.

### 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 (D) to the measuring spot diameter (S). The larger the distance to the object, the larger the measuring spot diameter and hence, the less precise the measured result. The device calculates an average temperature from all the temperatures in the measuring spot.



MULTIPOINT-LASER
Distance : Spot = 40 : 1

Ø 12 mm
@ 480 mm

Ø 48 mm
@ 1920 mm
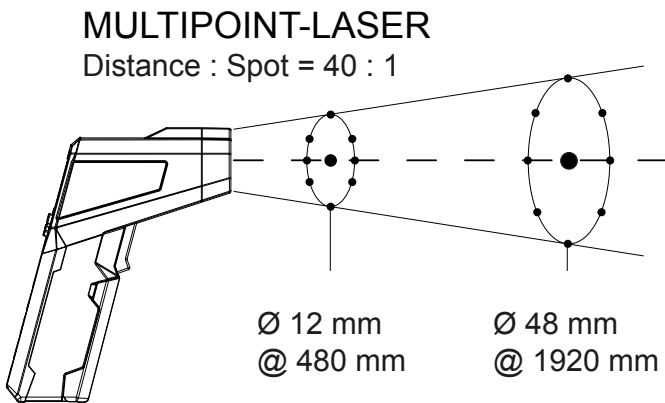
### Degree of emission

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

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

A material's emissivity depends on various factors, e.g. on

- Material composition
- Surface condition
- Temperature

The emissivity can range between 0.1 and 1 (in theory).

The following rule of thumb can be assumed:

- When a material is rather dark and its surface texture matt, it probably has a high emissivity.
- The brighter and smoother the surface of a material, the lower will be its emissivity, 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.

### Emissivity table

The table below may be used as reference for setting the degree of emission. It supplies reference values for the emissivity of common materials.

| 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 |
| 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 | 0.60 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) | 0.90 to 0.95 |

| Material | Degree of emission |
|---|---|
| Inconel, electro-polished | 0.15 |
| Inconel, oxidized | 0.70 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 | 0.70 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 |
| 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 |

## Device depiction
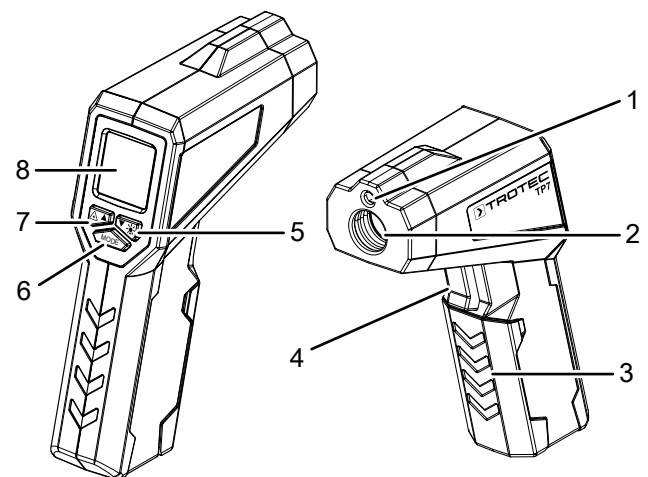


| No. | Designation |
|---|---|
| 1 | Laser pointer |
| 2 | Infrared sensor |
| 3 | Battery compartment with cover |
| 4 | Measurement button |
| 5 | Lamp button |
| 6 | *MODE* button |
| 7 | Laser button |
| 8 | Display |

## Display
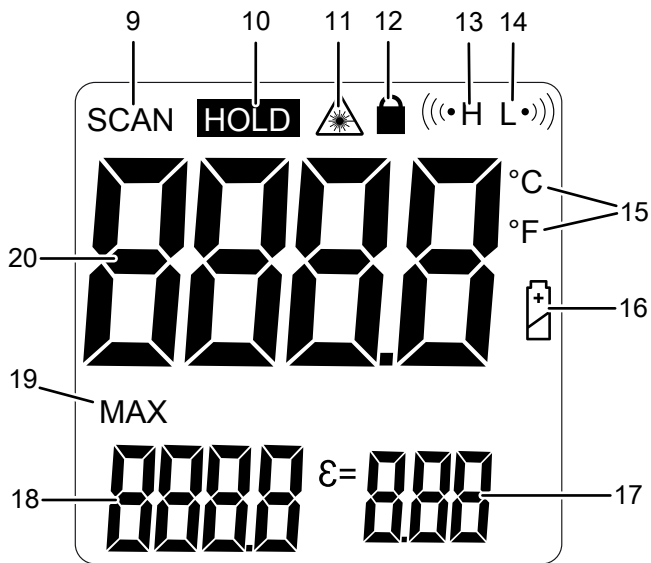


| No. | Designation |
|-----|-------------|
| 9 | *SCAN* indication |
| 10 | *HOLD* indication |
| 11 | Laser indication |
| 12 | Indication for continuous measurement |
| 13 | Indication of the upper alarm threshold |
| 14 | Indication of the lower alarm threshold |
| 15 | Temperature unit indication |
| 16 | Battery status indication |
| 17 | Indication of the degree of emission |
| 18 | MAX temperature indication |
| 19 | MAX indication |
| 20 | Measurement value display |

## Technical data

| Parameter | Value |
|-----------|-------|
| Model | TP7 |
| Weight | 224 g |
| Dimensions (length x width x height) | 160 mm x 49 mm x 122 mm |
| Measuring range | -50 °C to 1000 °C (-58 °F to 1832 °F) |
| Resolution | 0.1 °C / °F |
| Target display | Laser class II, 630 to 670 nm < 1 mW |
| Accuracy | ±2.5 °C (±4.5 °F) at -50 °C to 20 °C (-58 °F to 68 °F) ±1 % at 21 °C to 300 °C (69 °F to 572 °F) ±1.5 % at 301 °C to 1000 °C (573 °F to 1832 °F) |
| Degree of emission | Adjustable from 0.10 to 1.0 |
| Optical resolution | 40:1 (D:S) |
| Smallest measuring spot | ø 25.4 mm |
| Spectral sensitivity | 8~14 µm |
| Response time | < 150 ms |
| Operating temperature | 0 °C to 50 °C (32 °F to 122 °F), 10 % to 90 % RH |
| Storage conditions | -10 °C to 60 °C, < 80 % RH |
| Power supply | 9 V battery |
| Switch-off | After approx. 10 seconds of non-use |

### Scope of delivery

- 1 x Device TP7
- 1 x 9 V battery
- 1 x Quick guide
- 1 x Storage bag

## Transport and storage

**Note**

If you store or transport the device improperly, the device may be damaged.
Note the information regarding transport and storage of the device.

### Transport

For transporting the device use a suitable bag to protect it from external influences.

The manufacturer packed the device to the best of his abilities to protect it against transport damage.

### Storage

When the device is not being used, observe the following storage conditions:
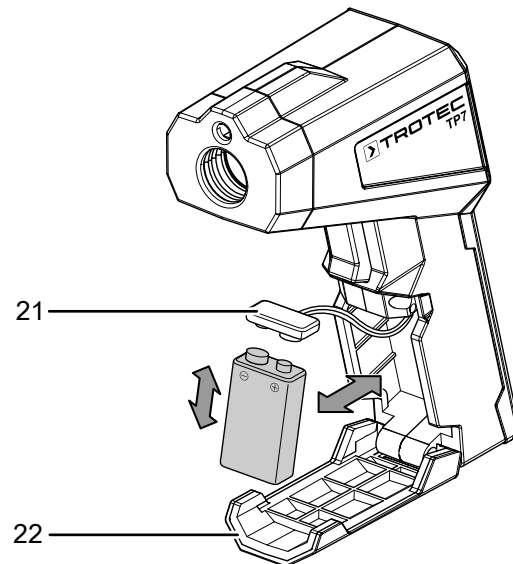
- dry and protected from frost and heat
- protected from dust and direct sunlight
- The storage temperature is the same as the range given in the Technical data chapter.
- Remove the batteries from the device.

## Operation

**Inserting the battery**

**Note**

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



1. Open the battery compartment by folding open the cover (22) with your fingers.
2. Use the battery clip (21) to connect the new battery (1 x 9 V) with correct polarity.
3. Close the cover of the battery compartment.

**Carrying out a measurement**

**Info**

Please 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 40:1 ratio of the distance to the measuring spot diameter. For accurate measurements the measuring object should be at least twice as large as the measuring spot.

## Carrying out a quick measurement

Please proceed as follows to carry out a quick measurement:
1.  Point the device at the object to be measured.
2.  Press the Measurement button (4).
    ⇨  The device turns on and carries out a measurement.
    ⇨  The currently measured value will be indicated on the display.

## Carrying out an extended measurement

Please proceed as follows to carry out a somewhat longer measurement:
1.  Point the device at the object to be measured.
2.  Hold onto the Measurement button (4) if you want to perform a prolonged measurement.
    ⇨  The device turns on and carries out a measurement.
    ⇨  The SCAN indication (9) will appear on the display to indicate that the measurement is in progress.
    ⇨  The currently measured value will be indicated on the display.
3.  Let go of the Measurement button (4).
    ⇨  The device stops the measurement and indicates this by displaying HOLD (10).
    ⇨  The maximum value (19) of the last measurement will be shown in addition.

## Setting the temperature unit (°C / °F)

The default setting for the temperature unit is °C. This setting can be manually changed to °F at the device.

Please proceed as follows to change the temperature unit:
1.  Repeatedly press the MODE button (6) until the Temperature unit indication (15) flashes.
2.  Press the Laser button (7) or the Lamp button (5) to change the temperature unit at the device.

## Switching the laser pointer on or off

Ex works the laser pointer is switched off.

⚠ **Warning of laser radiation**
Please observe that with a switched-on laser the laser pointer will go on as soon as you press the Measurement button (4).
**Danger due to laser radiation!**

Please proceed as follows to switch the laser pointer on or off:
1.  Press the Laser button (7).
    ⇨  The Laser pointer ON symbol is displayed in the Laser indication (11).
    ⇨  The laser pointer is switched on.
2.  Press the Laser button (7) again.
    ⇨  The Laser pointer ON symbol is no longer displayed in the Laser indication (11).
    ⇨  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.

Please proceed as follows to activate or deactivate the display illumination:
1.  Press the Lamp button (5).
    ⇨  The display illumination will be switched on.
2.  Press the Lamp button (5) again.
    ⇨  The display illumination will be switched off.

The device memorizes the selected setting when switching off.

## Setting the degree of emission

To achieve a more precise measurement you can previously enter a degree of emission that is as accurate as possible.

Please proceed as follows to set the degree of emission at the device:
1.  Repeatedly press the MODE button (6) until the Indication of the degree of emission (17) flashes.
2.  Use the Laser button (7) or the Lamp button (5) to change the degree of emission to the desired value between 0.10 and 1.00.
3.  Press the Laser button (7).
    ⇨  The set emissivity value will be increased by 0.01.
4.  Press the Lamp button (5).
    ⇨  The set emissivity value will be reduced by 0.01.
5.  Press the Measurement button (4) to adopt the set emissivity value for your measurement.

## Switching the continuous measurement function on or off

The device comes with a function for continuous measurements. If this function is activated, the device constantly measures the temperature until deactivated.

Please proceed as follows to switch on the continuous measurement function:
1.  Repeatedly press the MODE button (6) until the corresponding icon in the Indication for continuous measurement (12) flashes.
    ⇨  The characters OFF appear on the upper measurement value display (20).
2.  Press the Laser button (7) or the Lamp button (5).
    ⇨  The characters ON appear on the upper measurement value display (20).
3.  Press the Measurement button (4) to start a continuous measurement.
    ⇨  The device starts measuring.
4.  Press the Measurement button (4) again to stop the continuous measurement operation.
    ⇨  The device stops the continuous measurement operation and indicates the determined measured value.

## Setting the upper and lower alarm thresholds

You can set both an upper and lower alarm threshold for the measured value at the device. Upon exceeding or falling below this value an acoustic signal will be emitted by the device. Additionally, the display lights up in one of the following colours:

| Display colour | Meaning |
|---|---|
| Flashes red | Surface temperature exceeds activated upper threshold. The display flashes red and a constant alarm tone is emitted. Also works when the display illumination is deactivated. |
| Flashes blue | Surface temperature below activated lower threshold. The display flashes blue and a constant alarm tone is emitted. Also works when the display illumination is deactivated. |
| Continuously illuminated in green | Surface temperature is in normal range. The display will only be illuminated in green if the display illumination is activated. |

Please proceed as follows to set the upper and lower alarm thresholds:

1. Repeatedly press the MODE button (6) until the corresponding icon flashes in the Indication of the upper alarm threshold (13) / Indication of the lower alarm threshold (14).
   ⇨ The characters OFF appear on the upper measurement value display (20).
2. Press the Laser button (7) or the Lamp button (5).
   ⇨ The characters ON appear on the upper measurement value display (20).
3. Then press the MODE button (6) again.
   ⇨ The currently saved value for the alarm threshold will be indicated on the upper measurement value display (20).
4. Use the Laser button (7) or the Lamp button (5) to change the value for the alarm threshold as desired.

## Enabling / disabling the alarm threshold

Please proceed as follows to enable / disable the upper and lower alarm thresholds:

1. Repeatedly press the MODE button (6) until the corresponding icon flashes in the Indication of the upper alarm threshold (13) / Indication of the lower alarm threshold (14).
   ⇨ The characters OFF appear on the upper measurement value display (20).
2. Press the Laser button (7) or the Lamp button (5) to activate the alarm threshold.
   ⇨ The characters ON appear on the upper measurement value display (20).
   ⇨ The desired alarm threshold is now activated.
3. Press the Laser button (7) or the Lamp button (5) again to deactivate the alarm threshold.
   ⇨ The characters OFF appear on the upper measurement value display (20).
   ⇨ The desired alarm threshold is now deactivated.

## Maintenance and repair

### Battery change

A battery change is required, when a battery indication lights up on the display (8) or the device can no longer be switched on. See chapter Operation.

### Cleaning

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

### Repair

Do not modify the device or install any spare parts. For repairs or device testing, contact the manufacturer.

## Errors and faults

The device has been checked for proper functioning several times during production. If malfunctions occur nonetheless, check the device according to the following list.

The device does not switch on:
- Check the charging status of the battery. Change the battery, if required (see chapter Inserting the battery).
- Make sure that the battery is properly positioned. Check the polarity is correct.

## Disposal

The icon with the crossed-out waste bin on waste electrical or electronic equipment stipulates that this equipment must not be disposed of with the household waste at the end of its life. You will find collection points for free return of waste electrical and electronic equipment in your vicinity. The addresses can be obtained from your municipality or local administration. For further return options provided by us please refer to our website https://de.trotec.com/shop/.

The separate collection of waste electrical and electronic equipment aims to enable the re-use, recycling and other forms of recovery of waste equipment as well as to prevent negative effects for the environment and human health caused by the disposal of hazardous substances potentially contained in the equipment.

In the European Union, batteries and accumulators must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators. Please dispose of batteries and accumulators according to the relevant legal requirements.