Instruction Manual
for
No. 1081-00 Pocket Sized Infrared Thermometer
Model PC-8400 Ⅱ

SATO KEIRYOKI MFG. CO., LTD.

1. Introduction

Thank you for purchasing the pocket-sized Infrared Thermometer Model PC-8400Ⅱ.

. This product is designed to measure temperature using a non-contact method. Do not use it for other purposes.

. Read this manual thoroughly before using the PC-8400Ⅱ. Keep the manual in a safe place for future references whenever necessary.

WARNING

The PC-8400Ⅱ is not explosion-proof. Never use it in an atmosphere containing flammable gases.

Beware of explosion!

2. Overview

The PC-8400Ⅱ is a non-contact infrared thermometer, which detects the infrared energy emitted from an object and converts it into a temperature reading. The product can measure the temperature of the surface instantly without touching the object.

3. Features

- Non-contact, instant temperature measurement
  The temperature on the surface of the object can be measured instantly by simply pressing the Scan key on the PC-8400Ⅱ.

- Pocket-sized infrared thermometer
  The PC-8400Ⅱ fits in the pocket, assuring excellent portability.

- Adjustable Emissivity
  Emissivity specific to the material of the object to be measured can be set.

- Spot Guide
  A trumpet-shaped measurement spot guide ensures accurate and easy recognition of the measurement spot.

- Continuous measurement by LOCK function
  The LOCK function permits continuous measurement without having to keep pressing the Scan key during measurement, which is useful for long-time measurement.

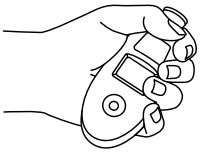
- MAX value (highest temperature) and MIN value (lowest temperature) display
  The highest and lowest temperatures measured are stored and can be displayed as maximum (MAX) and minimum (MIN) values.

⚠ CAUTIONS

- Do not use this unit as a clinical thermometer.

- The PC-8400Ⅱ does not illuminate a laser. Although the label by the slot for the backup battery states "Battery for Laser", this thermometer does not have a laser. This slot should be used to store a backup battery.

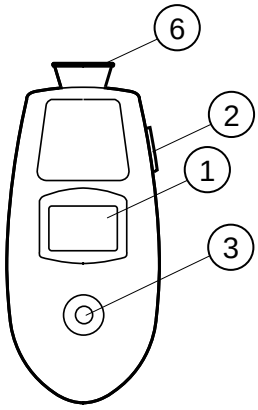
- Do not touch the measurement spot guide (trumpet-shaped section), or the measurement accuracy may be affected. Also, never grasp the guide when measuring.



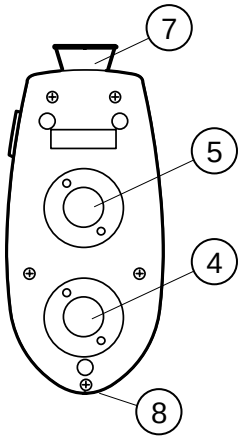
- Never expose the sensor section and the spot guide to vapor when measuring the liquid surface temperature to prevent condensation on the sensor lens or temperature fluctuations around the sensor, which may affect the measurement accuracy.

4. Names and Functions of Components

Front View



Rear View



(1) LCD : Displays the temperature readings and the status indicators of the unit.

(2) Scan key : Pressing this key starts measuring the surface temperatures of the object. The power is automatically turned off approximately 15 seconds after releasing the Scan key (automatic power-off function).

(3) Mode key: Pressing this key in the measurement mode (normal measurement status) allows the following to be set:
  a. MAX value (highest temperature) display function
  b. MIN value (lowest temperature) display function
  c. LOCK (for continuous measurement) function
  d. Emissivity setting function

(4) Battery slot: Holds a CR2032 lithium button-type battery.

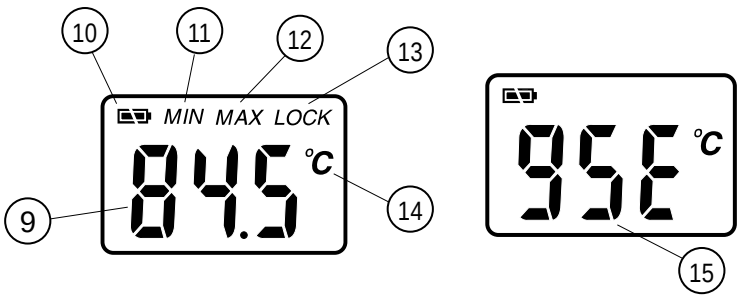
(5) Slot for a backup battery
: A backup CR2032 lithium battery can be stored to ensure rapid battery replacement.

(6) Sensor section: A thermopile is used to detect infrared rays emitted from the object.

(7) Spot Guide : Helps recognizing the measurement spot visually. By referring to the label put in the case, you can locate the spot you are measuring more accurately.

(8) Neck strap hole: Used for attaching a neck strap.

LCD



(9) 7-segment display : Displays the measured temperature. When the MAX or MIN value display function is set, the highest or lowest temperature is displayed.

(10) Low battery mark : Displays a full battery mark when the battery power is sufficient. The thermometer operates normally. Displays a half-full battery mark when the battery is low. Replace the battery. Goes off when the battery runs out; do not use the PC-8400Ⅱ to prevent it from malfunctioning.

(11) "MIN" : Lights while the lowest temperature is displayed.

(12) "MAX" : Lights while the highest temperature is displayed.

(13) "LOCK" : Lights while in the continuous measurement mode by the LOCK function.

(14) Unit of temperature: The measured temperature is displayed in centigrade (°C) by default.

(15) Emissivity display : The emissivity (E) that has been set for the PC-8400Ⅱ is displayed as the value E x 100. The above example shows that the emissivity has been set to the default value of 0.95. For details on how to change the emissivity, see "Emissivity Setting Function."

5. Notes on Use

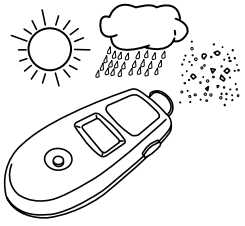
Be sure to observe the following precautions in order to use this unit correctly.

- Do not use this unit as a clinical thermometer.

- This is a non-contact thermometer. Do not let the unit touch the object to be measured. If the unit touches a hot object, it may result in measurement errors or failure.

- Never disassemble or modify this unit. Doing so may result in failure.

- Do not drop this unit or apply vibration/impact to it. This unit is a precision instrument.



- Do not use this unit in a place exposed to direct sunlight or near heating equipment. Doing so may result in measurement errors or deformation/discoloring of the casing.

- This thermometer is designed for use in the ambient temperature range of 0 to 50°C and the measuring range is -60 to 240°C. Using the unit outside the specified range will result in failure.

- Do not use this unit in a dusty environment. The accuracy of measurement is affected by dust or dirt on the lens. Always wipe off dust and dirt after each use. For details, refer to "Maintenance".

- Do not touch the measurement window with a sharp or hard object. Doing so may damage the lens, causing loss of measurement accuracy.

- Do not use this unit in an environment where electrical noise is generated. Doing so may result in unstable display or larger errors. Also, do not bring the unit close to a charged object.

- Never use the unit in water.

- If this unit is not going to be used for a long time, always remove the battery from the unit. Otherwise, the battery may leak fluid, resulting in failure.

- Do not dispose of the used battery in a fire.

- Keep the battery out of the reach of children. If you have swallowed the battery accidentally, consult a doctor immediately.

- For environmental conservation purposes, dispose of the used battery in compliance with local rules and regulations.

- Do not wash or wipe this unit with alcohol, thinner, or other organic solvents. If the unit becomes dirty, wipe it with a tightly-wrung gauze or the like that has been dipped in warm water with neutral detergent.

- Do not wipe the temperature measurement section (infrared lens) directly with gauze. For details, refer to "Maintenance".

- Glass does not transmit wavelengths used by this thermometer. Therefore, when an object is placed beyond glass, this unit detects the temperature of the glass and displays its temperature reading.

- If the ambient temperature fluctuates excessively, the measurement accuracy may be affected. Wait for a while for the unit to properly adapt to the ambient temperature. For a change of temperature of 10°C or more, wait for at least 30 minutes before measurement.

- Never grasp the measurement spot guide (trumpet-shaped section) during measurement, or the measurement accuracy may be affected.

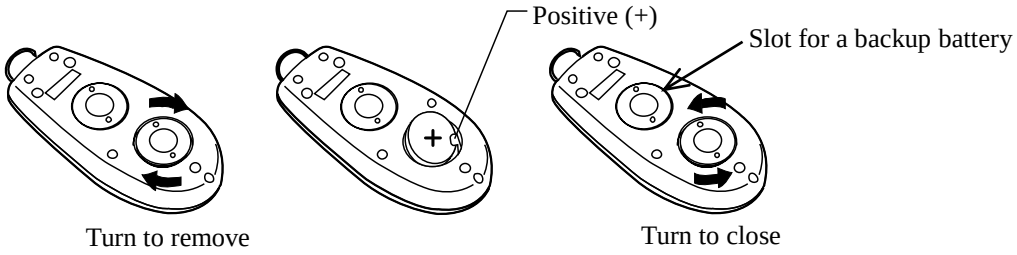
6. Notes on Storage

-The storage ambient for the PC-8400Ⅱis -10 to 50°C and less than 90%RH. It is recommended to be stored with a desiccant at around room temperature.

- Leaving this unit inside a car under the full sun in a hot climate will cause it to become extremely hot, possibly resulting in failure. Do not leave it in such hot places.

7. Battery Installation and Replacement

(1) Turn the battery slot cover clockwise and remove it.
(2) Remove the used battery (CR2032) from the slot.
(3) Insert a new battery in the slot. Make sure the positive (+) side is facing up.
(4) Put the cover on the slot and turn it counter-clockwise.



Note: When the battery mark goes off, immediately replace the battery with a new one. Using the thermometer while the battery mark is not displayed may affect the measurement accuracy and cause malfunctions.

⚠ CAUTIONS

- If the thermometer is not going to be used for a long time, always remove the battery to prevent it from self-discharging or leaking fluid.

- Although the label by the slot for the backup battery states "Battery for Laser", the PC-8400 Ⅱ does not have a laser. This slot should be used to store a backup battery.

- The life of the battery set in a unit at shipment may be shorter.

8. Measurement

(1) Press the Scan key to start measuring: Pressing the Scan key turns on the unit.

(2) Release the Scan key to cancel measuring: Releasing the Scan key turns off the unit after approximately 15 seconds, displaying "OFF."
(Automatic power-off function)

(3) With the PC-8400 Ⅱ , the ratio of D (the distance to the object) to S (the diameter of the measurement spot on the object) is 6: 1. For details, see "Notes on Measurement"

⚠ CAUTIONS

- Do not use the PC-8400 Ⅱ near a microwave oven. If used in a strong electromagnetic field, readings may be inaccurate or unstable.

- The default set of the emissivity is 0.95. If the emissivity of the object to be measured is other than 0.95, be sure to change the emissivity as described in "Emissivity Setting Function." Otherwise, accurate readings will not be obtained.

- Do not get too close to an object whose surface is hot during measuring, otherwise you may burn yourself by accidentally touching the object or by its radiant heat.

- Upon power-on, a value other than the measured value may be displayed instantly. This is not a fault.

9. Continuous Measurements by the LOCK function

Continuous measurement for approximately 60 minutes is possible by keeping the Scan key pressed while measuring the surface temperature of the object. For easier "finger-free" operation, set the LOCK function as follows:

(1) Press the Scan key once, and then press the Mode key three times. The "LOCK" indicator blinks on the upper right of the LCD.

(2) Press the Scan key once again. The "LOCK" indicator stops blinking and remains lit, showing that the LOCK function is set.

Once the LOCK function has been set, measurements can be continued for up to approximately 60 minutes. This operation is useful when monitoring the surface temperature of one object in series. If you want to stop the measurement within 60 minutes, press the Scan key. Then, the LOCK function is cancelled and the "LOCK" indicator on the LCD goes off.

10. MAX and MIN Value Display Functions

The PC-8400 Ⅱ can store the highest and the lowest values among the readings obtained.

- **MIN value (lowest temperature) display function**

1. To set this function, press the Scan key and then the Mode key to display the "MIN" indicator (blinking) on the LCD. Press the Scan key once again to complete the setting.
2. To display the MIN value, press the Scan key and hold it (continuous measurement). When you release the Scan key, the latest MIN value remains displayed on the LCD.
3. To clear this MIN value, press the Scan key again. This returns to the MIN value display function.
4. To cancel the MIN value display function, press the Mode key while the MIN value is being displayed.

- **MAX value (highest temperature) display function**

1. To set this function, press the Scan key once and then the Mode key twice to display the "MAX" indicator (blinking) on the LCD. Press the Scan key once again to complete the setting.
2. To display the MAX value, press the Scan key and hold it (continuous measurement). When you release the Scan key, the latest MAX value remains displayed on the LCD.
3. To clear this MAX value, press the Scan key again. This returns to the MAX value display function.
4. To cancel the MAX value display function, press the Mode key while the MAX value is being displayed.

- The MIN or MAX value displayed during the MIN/MAX display function is updated whenever a newer MIN or MAX value is stored while measuring. The PC-8400 Ⅱ can thus be used as a peak hold meter (indication of the maximum or minimum temperature measured during a certain time).

- The MAX or MIN value display function that has been set will be cancelled if the automatic power-off function is activated.

Note: If the measured temperature exceeds 250°C, the MAX value is stored as "Hi", and if lower than -61°C, the MIN value is stored as "Lo".

11. Emissivity Setting Function

The PC-8400 Ⅱ is shipped with the default emissivity set to 0.95.

All objects emit infrared radiation corresponding to their surface temperature and emissivity. Many foods and plastics have emissivity of 0.95 and 0.95 is usable to measure these object.

If a more precise measurement of the surface temperatures is required, set the emissivity of the object by referring to the emissivity table given below.

- **Setting the emissivity**

Press the Scan key once and the Mode key five times in succession. Then, "95E" is displayed on the LCD, showing that the emissivity is set to 0.95.

To change this value, press the Scan key. Every time you press the Scan key, the value on the LCD advances by 1, representing an increase in emissivity of 0.01. When the desired emissivity is displayed on the LCD, press the Mode key to fix the value. Then the new emissivity is set. You can set the emissivity in the range of 0.05 through 1.00

Note: The emissivity value on the LCD will go off if the automatic power-off function is activated before pressing the Mode key, resulting in no change to the value.

The table below lists the typical materials with their emissivity. Note that the emissivity varies with the temperature and surface condition of the object; the values are given for reference only.

1) Emissivity Table

The table below lists the typical emissivity (near 0.95) of different types of materials. (The values are presented only for reference; the emissivity varies with the temperature and surface conditions of objects.)

Object	Emissivity	Object	Emissivity	Object	Emissivity
Meat	0.98	Grain	0.98	Skin	0.98
Fish	0.98	Oil	0.98	Water	0.92- 0.96
Vegetable	0.98	Plastic	0.95	Soil	0.92- 0.96
Bread	0.98	Rubber	0.95	Wood	0.98
Confectionery	0.98	Carbon	0.98	Paper	0.92

2) Emissivity Table

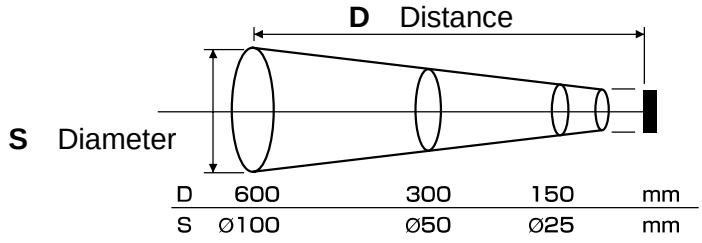
The table below lists materials whose emissivity is significantly different from 0.95.

Object	Emissivity	Object	Emissivity	Object	Emissivity
Iron	0.85	Brass	0.60	Ceramic	0.80
Cast iron	0.85	Tile	0.80	Nichrome	0.60
Aluminum	0.30	Asbestos	0.90	Glass	0.85
Cupper	0.80	Asphalt	0.85		

12. Notes on Measurement

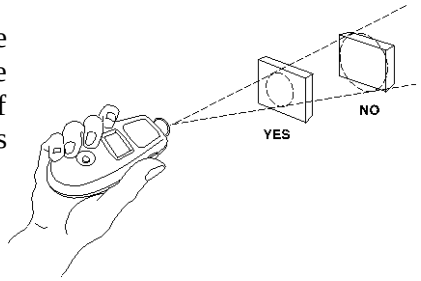
- **Measurement Spot Size**

The measurement spot size of this thermometer changes in accordance with the distance as shown below.



The diameter of the measuring spot shown above is defined on the basis of the area that receives 90% or more of the energy. The D:S ratio, which is the ratio of the distance between the object and the thermometer to the size of the spot, is preset at 6:1 (D = measuring distance, S = diameter of spot). For example, for the distance of 150 mm, a spot circle of diameter 25 mm can be measured. If the object is too small, make the distance smaller by bringing the thermometer closer to the object. For higher accuracy, make sure that the area of the object is at least twice as large as the spot being measured.

Note: If the area of the object is much larger than the spot size, the accuracy of measurement is affected. Also, if the area of the object is much smaller than the spot size, the accuracy of measurement may be affected by inclusion of a part that is not supposed to be measured.



- **High-temperature Measurement**

1. Operating the thermometer continuously to measure a high-temperature (200°C or more) object at a short distance (30 mm or less) for a long time (three minutes or more) may cause a drop in the performance of the infrared lens. When measuring a hot object of 200°C or more, the distance should be 30 mm or more and operation should be completed within a short time.

2. There is also the risk of burning your hand by accidental contact with an excessively hot object. Secure a safe distance from the object if the object is known to be hot.

- **Low-temperature measurement**

The ambient operating temperature range of the PC-8400 Ⅱ is 0 to 50°C. Never use this thermometer in a freezer of 0°C or colder. When used in a refrigerator of 0°C or warmer, erratic readings may be displayed until the thermometer has adapted to the ambient temperature inside the refrigerator. When the PC-8400 Ⅱ is moved to an atmosphere at least 10°C higher or lower than where it was moved from, allow the thermometer to adapt to the new ambient temperature for at least 30 minutes before starting measurement.

- **Measurement of an object having an emissivity other than 0.95**

Set emissivity to 0.95 and apply heat-resistant paint or tape that has an emissivity close to 0.95 to the object to be measured.

13. Switching between Centigrade (°C) and Fahrenheit (°F)

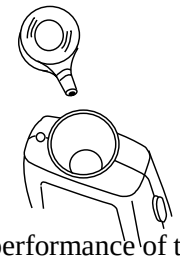
The PC-8400Ⅱ can use either measurement unit, Centigrade (°C) (default) or Fahrenheit (°F). To switch from one unit to the other, press the Scan key once and then the Mode key four times. When the current unit indicator begins blinking, press the Scan key again to change the unit.

14. Putting the vinyl cover onto the Thermometer

It is recommended to use the thermometer putting the vinyl cover when it is used in a dusty environment or in the place oil and water may be splashed. (Main unit is not waterproof type)

15. Maintenance

The accuracy of measurement is affected by dust or dirt on the surface of the infrared lens. Prevent dirt or dust from adhering to the surface of the lens during use or storage. When removing dirt from the infrared lens, use a blower for camera lenses. If stubborn stains persist, clean the surface of the lens softly with a swab moistened with lens cleaning liquid.



Note: Never clean the infrared lens with water or detergent. Doing so may affect the performance of the lens and cause inaccurate measurements.

16. Error Codes

Error Code	Description	Action to be taken
Hi	Measured temperature exceeds 250°C.	Immediately stop measuring the object which is too hot. Otherwise, the sensor may fail. The measurable temperature range is from –60 to 250°C.
Lo	Measured temperature is lower than –60°C.	Immediately stop measuring the object which is too cold. Otherwise, the sensor may fail. The measurable temperature range is from –60 to 250°C.
Er2	The ambient temperature changes are too extreme.	Move the thermometer to an environment where the ambient temperature is stable. (When the ambient temperature changes are too extreme for the temperature compensation function to work properly, the readings become unstable.)
Er3	The ambient temperature is out of the operating range of 0 to 50°C.	Select an environment where the ambient temperature is in the range of 0 to 50°C.
Er	Trouble other than those listed above	Remove the battery and wait for one minute before reinserting it. If the "Er" code still remains lit, the internal electronic circuits may be damaged. Contact our representative or our Service Network.

17. Troubleshooting

Refer to the table below before consulting us or our Service Network for repair service.

Problem	Possible Cause	Remedy
Power does not turn on.	Battery power is insufficient.	Replace the battery. See "Replacing the Battery"
	If the power does not turn on even after replacing the battery, an element inside the thermometer may have been damaged by impact.	Was the thermometer dropped or given a strong impact? In this case, the thermometer must be repaired. Contact the dealer from which the product was purchased, or our service network.
The readings are abnormal.	Battery power is insufficient	Replace the battery. See "Replacing the Battery"
	Ambient temperature is fluctuating.	Allow the thermometer to adapt to the ambient temperature.
	The PC-8400Ⅱ is held by Spot Guide.	Hold the PC-8400Ⅱ properly by its body. Holding the Spot Guide will affect the measurement accuracy.
	The PC-8400Ⅱ is used in an environment with electrical noise.	Move the thermometer to a place free from electrical noise that can cause abnormal readings.
	Wrong emissivity is set.	Set the proper emissivity of the object to be measured by referring to the table of emissivities.
	The surface of the object to be measured is frozen or covered with condensation or dust.	Clean the surface of the object. Condensation or dust on the surface of the object will affect the readings.
The readings are unstable.	The battery power is insufficient.	Replace the battery with a new one. (See "Battery Installation and Replacement".)
	The ambient temperature changes are too extreme.	Leave the PC-8400Ⅱ in an atmosphere with a stable temperature and allow the thermometer to adapt to the ambient temperature. (When the ambient temperature changes are too extreme for the temperature compensation function to work properly, the readings become unstable.)
	The emissivity of the object is too small.	If the emissivity of the object is smaller than 0.30, the infrared energy emitted from the object may be insufficient to give stable readings. Place black mending tape over the surface of the object and set the emissivity to 0.95 before starting measurement.
	The PC-8400Ⅱ is used in an environment with electrical noise.	Move the thermometer to a place free from electrical noise that can cause abnormal readings.

18. Specifications

Cat. No.	1081-00
Model No.	PC -8400 II
Measuring range	-60°C to 240 °C
Display range	-60°C to 250 °C
Accuracy (ambient at 23±5 °C with 0.95)	±5°C at -60 to -41 °C ±4°C at -40 to -21 °C ±3°C at -20 to 0.1 °C ±2°C at 0.0 to 99.9 °C ±3% rdg at 100.0 to 199.9 °C ±4% rdg at 200 to 240 °C
Repeatability	±1 °C
Resolution	0.1 °C at -9.9 to 199.9 °C 1 °C at other than above
Response time	0.5 to 1 second (depends on the ambient temperature)
Emissivity	Adjustable from 0.05 to 1.00
Detective element	Thermopile
Distance to spot size (D:S)	About 6 :1
Operating ambient	0 to 50 °C Lower than 80% RH (no condensing)
Storage ambient	-10 to 50 °C Lower than 90% RH (no condensing)
Functions	Adjustable emissivity (ε =0.05 to 1.00) MIN: minimum memory data MAX: maximum memory data, LOCK: continuous measurement Auto power-off
Power requirements	Lithium coin battery 1 pc. (CR2032)
Battery life	About 20 hours (20 times of 60 min. measurement by LOCK function at 20°C)
Materials	Main unit: ABS resin Trumpet shaped spot guide: POM resin Neck strap: Nylon
Dimensions	51mm(W) x 122mm(H) x 22.5mm(D)
Weight	approx. 0.063kg (include 2 batteries)
Accessories	2 lithium coin batteries, neck strap, vinyl cover

* All specifications and appearance subject to change with or without notice.

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