HIOKI

INSTRUCTION MANUAL

# 3415-02, 3416-02, 3418-01

# TEMPERATURE HiTESTER

HIOKI E. E. CORPORATION

## Contents

# Introduction

Thank you for purchasing the HIOKI "3415-02/3416-02/3418-01 TEMPERATURE HiTESTER." To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

# Safety Notes

**⚠ WARNING**

**Mishandling this product during use could result in injury or death, as well as damage to the product. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from product defects.**

This manual contains information and warnings essential for safe operation of the product and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

**Safety symbols**

| | |
|---|---|
|  | In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the product. |
|  | Indicates warnings relating to the laser. |

The following symbols are used in this Instruction Manual to indicate the relative importance of cautions and warnings.

| | |
|---|---|
| ⚠DANGER | Indicates that incorrect operation presents extreme danger of accident resulting in death or serious injury to the user. |
| ⚠WARNING | Indicates that incorrect operation presents significant danger of accident resulting in death or serious injury to the user. |
| ⚠CAUTION | Indicates that incorrect operation presents possibility of injury to the user or damage to the equipment. |
| NOTE | Denotes items of advice related to performance of the equipment or to its correct operation. |

- Accuracy
  rdg. (displayed or indicated value)
  This signifies the value actually being measured, i.e., the value that is currently indicated or displayed by the measuring instrument.

- Check before use

  Before using the product, inspect it and check the operation to make sure that the product was not damaged due to poor storage or transport conditions. If damage is found, contact your dealer or HIOKI representative.

# Inspection

When you receive this product, before use, please check that no abnormality or damage has occurred during delivery. In particular, be sure to check the accessories, the liquid crystal display, the control keys, and the lens. In the unlikely event of damage, or if the product does not function according to specification, you should immediately contact the dealer from whom you bought the product, or the nearest HIOKI service facility.

# Notes on Use

In order to ensure safe operation and to obtain maximum performance from the product, observe the cautions listed below.

**⚠ DANGER**

- **Operation of this product according to any procedure not specified in this manual may cause explosion due to dangerous laser radiation.**
- **The 3415-02 (2-beam laser marker type product) uses as a light source a semiconducting laser which emits visible light, and which conforms to JIS standard class 2 (JIS C6802). (Wavelength 670nm, maximum power output 1 mW) Since there is considerable danger of this laser light causing damage to the eyes, be very careful not to direct this laser light into your eyes or those of another person.**
- **Do not look directly into the laser light from the optical system.**
- **When measuring the temperature of an object which has a mirror finish, be careful not to allow the laser light beam to be reflected off the surface into your eyes or those of another person.**
- **Do not allow the laser light beam to impinge upon any gas which can explode.**

**⚠ WARNING**

- **To avoid electric shock, do not allow the product to get wet, and do not use it when your hands are wet.**
- **If the protective functions of the product are damaged, either remove it from service or mark it clearly so that others do not use it inadvertently.**

**⚠ CAUTION**

- Do not use the product near a device that generates a strong electromagnetic field or electrostatic charge, as these may cause erroneous measurements.
- The product should always be operated indoors in a range from 0℃ to 40℃(3415-02), 0℃ to 50℃(3416-02, 3418-01) and 35% to 80% rh or less.
- Do not store or use the product where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the product may be damaged and insulation may deteriorate so that it no longer meets specifications.

**⚠ CAUTION**

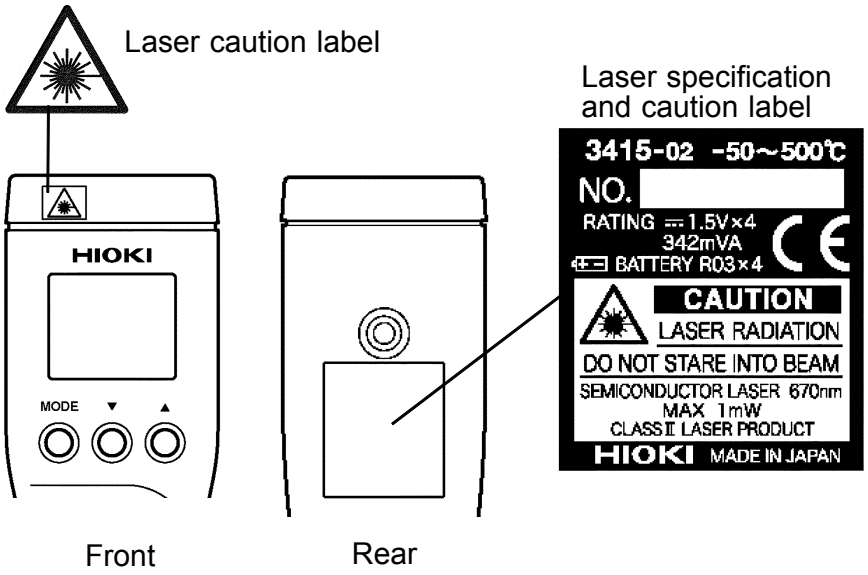
- This product is not designed to be entirely water- or dust-proof. To avoid damage, do not use it in a wet or dusty environment.
- Do not use the product where it may be exposed to corrosive or combustible gases. The product may be damaged or cause an explosion.
- To avoid damage to the product, protect it from vibration or shock during transport and handling, and be especially careful to avoid dropping.
- Do not point the lens at the sun or at any other source of strong light. If you do, the sensor may be damaged.
- Do not contact the lens against the object whose temperature is to be measured, or get it dirty, allow it to be scratched, or allow any foreign material to adhere to it. Doing so may cause errors.

**NOTE**

- Before use, verify that no damage has occurred due to careless storage or transport, and check the appearance and operation of the product.
- When the **B** mark on the display is flashing, the batteries are low. Fit new batteries.

## Warning Labels

Location of labels used in the HIOKI "3415-02 TEMPERATURE HiTESTER" are as follows.



# Chapter 1 Summary

## 1.1 Product Summary

1. Theory of Measurement
   Every object emits infrared energy in accordance with its temperature. By measuring the amount of this radiant energy, it is possible to determine the temperature of the emitting object.

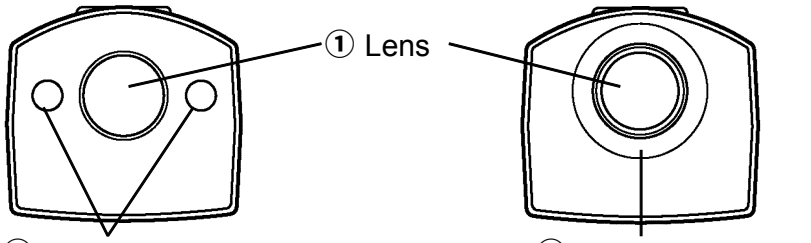
2. About infrared
   Infrared radiation is a form of light (electromagnetic radiation), and has the property that it passes easily through air, while it is easily absorbed by solid matter. With an emission thermometer which operates by detecting infrared radiation, accurate measurement is possible, irrespective of the air temperature or the measurement distance.

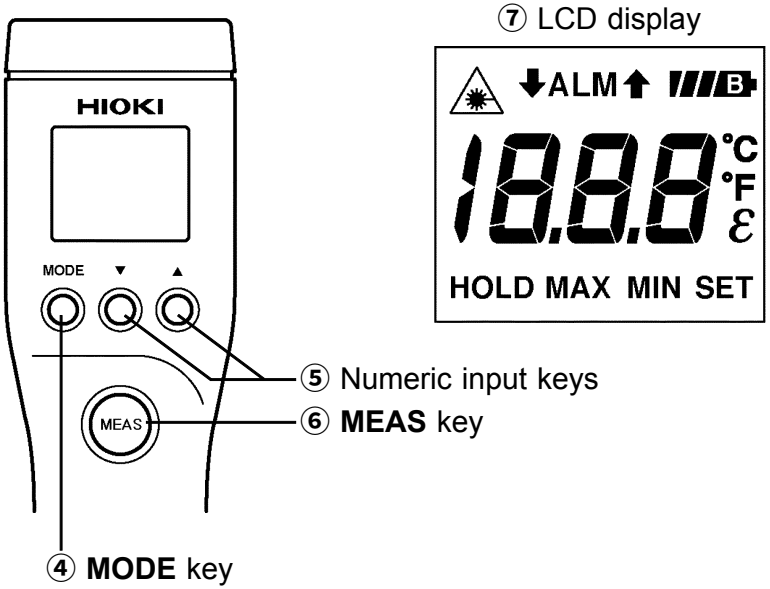
3. Emission Thermometer Structure
   Infrared radiation which has been emitted from the object is focused upon an infrared radiation sensor, via an optical system which includes a lens which is transparent to

infrared radiation, an 8 μm cuton filter, etc..
The output signal from the infrared radiation sensor is input to an electronic circuit along with the output signal from a standard temperature sensor.
The electronic circuit calculates the object temperature while applying standard temperature compensation, thermal emissivity compensation, etc., and displays the result.

# 1.2 Names and Functions of Parts

3415-02 2-beam laser marker type
3416-02 LED spot marker type
3418-01 Standard type



① Lens
Infrared rays from the object whose temperature is to be measured are received here.

② Laser marker beam emission openings(3415-02)
The laser marker beams are emitted from here.

③ LED mark beam emission opening(3416-02)
The LED mark beam is emitted from here.

④ **MODE** key
Pressing this key switches the mode around the cycle **ε** →**ALM↑** → **↓ALM**→**MAX**→**MIN**→ **HOLD**.

- **HOLD**: After measurement is completed, the **HOLD** indication appears, is illuminated, and the measured value is held.
- **ε**: The inherent thermal emissivity of the object is set using the ▼ and ▲ keys.
- **ALM↑**: The upper limit alarm temperature is set using the ▼ and ▲ keys.
- **↓ALM**: The lower limit alarm temperature is set using the ▼ and ▲ keys.
- **MAX**: The maximum temperature during measurement is displayed.
- **MIN**: The minimum temperature during measurement is displayed.

⑤ Numeric input keys

- ▼ key: The numerical value is reduced.
- ▲ key: The numerical value is increased.

If either of these numerical value keys is held down, the numerical value changes rapidly in the appropriate direction.

⑥ **MEAS** key

When pressed, the power is turned on and measurement starts. When released, measurement is terminated.

⑦ LCD display

- ⚠:Indicates whether the laser marker beam is on or not. During measurement with the laser marker beam on, this indication flashes (3415-02).
- B:Shows the amount of battery capacity remaining. If the battery voltage drops below the minimum level to guarantee accuracy, the B mark (only) flashes.
- **℃**:Turned on when the display is showing temperature in products of degrees Celsius.
- **℉**: Turned on when the display is showing temperature in products of degrees Fahrenheit.
- **HOLD**: Appears when the last measured temperature value is being held.
- **ε**: Appears when the thermal emissivity is being set.

- **ALM ↑**: Appears when the upper limit alarm temperature is being set.
- **↓ALM**: Appears when the lower limit alarm temperature is being set.
- **MAX**: Appears when the maximum temperature during measurement is being displayed.
- **MIN**: Appears when the minimum temperature during measurement is being displayed.
- **SET**: Blinking when a numerical value can be set.(during setting of **ε**, **ALM ↑**, and **↓ ALM**)

# Chapter 2
# Making Measurements

## 2.1 Turning the Power On

When the power is off, pressing the **MEAS** key turns on the power.
The values and settings on the LCD display return to the state before the power was last turned off.

NOTE

- If, from the power off condition, the **MEAS** key is held down for more than one second, measurement starts.

## 2.2 Measuring Temperature

1. Press the **MODE** key, repeatedly if necessary, until the ( **ε** ) mark lights up.
   Refer to the following table and, using the ▼ and ▲ keys, set the thermal emissivity for the object whose temperature is to be measured.

| Substance | Thermal emissivity | Substance | Thermal emissivity |
|---|---|---|---|
| Asphalt | 0.90 to 0.98 | Cloth (black) | 0.98 |
| Concrete | 0.94 | Human skin | 0.98 |
| Cement | 0.96 | Leather | 0.75 to 0.80 |
| Sand | 0.90 | Charcoal (powder) | 0.96 |
| Earth | 0.92 to 0.96 | Lacquer | 0.80 to 0.95 |
| Water | 0.92 to 0.96 | Lacquer (matt) | 0.97 |
| Ice | 0.96 to 0.98 | Rubber (black) | 0.94 |
| Snow | 0.83 | Plastic | 0.85 to 0.95 |
| Glass | 0.90 to 0.95 | Timber | 0.90 |
| Ceramic | 0.90 to 0.94 | Paper | 0.70 to 0.94 |
| Marble | 0.94 | Chromium oxides | 0.81 |
| Plaster | 0.80 to 0.90 | Copper oxides | 0.78 |
| Mortar | 0.89 to 0.91 | Iron oxides | 0.78 to 0.82 |
| Brick (red) | 0.93 to 0.96 | Textiles | 0.90 |

NOTE

- Variations in the surface condition and color of the object whose temperature is to be measured may cause the thermal emissivity ε to be somewhat different from the values in the above table. If an accurate

temperature measurement is desired for an object whose thermal emissivity is not known, black body tape or black body spray (sold separately) should be used. In this case the setting for thermal emissivity ( ε ) should be the value indicated on black body tape or black body spray.

2. Point the lens at the object whose temperature is to be measured.

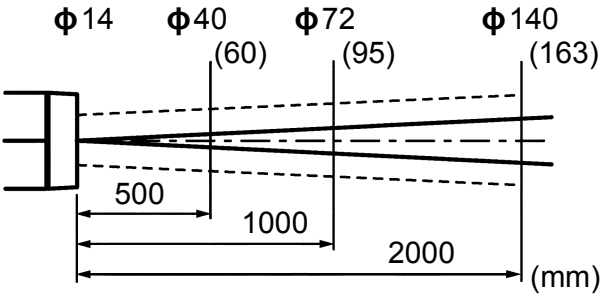
3. Press the **MEAS** key.
   Measurement is performed as long as the **MEAS** key is kept pressed.

**⚠ DANGER**

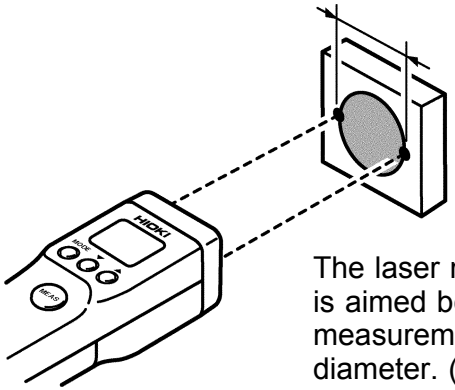
**With the 3415-02, whenever the indication ⚠ is flashing, the laser marker beam (class 2) is being emitted. Exercise extreme care not to allow the laser marker beam to enter your eyes (because of this laser light causing damage to the eyes) or those of another person.**

4. Referring to the figure, aim the laser beam at the object whose temperature is to be measured.
   - All dimension are millimeters, and ϕ represents a diameter.

3415-02/3418-01



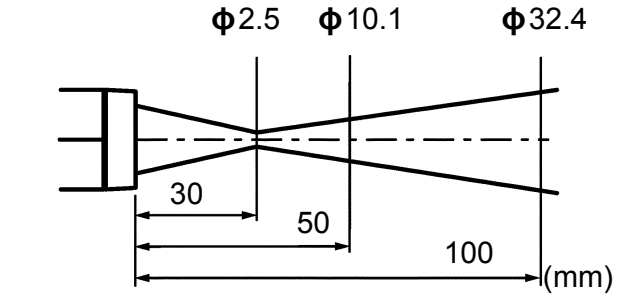

The dimensions in parenthesis show the target.



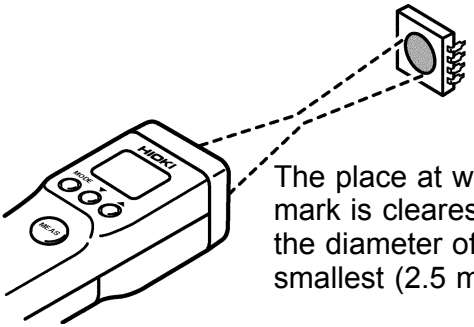

Target object

Measurement field diameter

The laser marker beams is aimed both sides of the measurement field diameter. (3415-02)




The marker beam is focused at a distance of 30 mm.




The place at which the "◎" mark is clearest is where the diameter of the spot is smallest (2.5 mm).

NOTE
- Although the field of measurement and the sighting almost coincide, actually the field of measurement corresponds to the diameter for 90% optical response. The object whose temperature is to be measured needs to be larger than the measurement diameter by an adequate margin – at least 1.5 to 2 times larger.

5. Read the display.

NOTE
- On releasing **MEAS** key, measurement is terminated. Then, the marker is turned off and the measurement data is held in display.
- When the measurement value is out of the measurement temperature range (-50 to 500 ℃), the display will flash.

## 2.3 Continuous Measurement

1. With the power source off, the product is put into the continuous measurement mode by holding the **MODE** key down and then pressing the **MEAS** key.
2. Anytime **MEAS** key is pressed, **MEAS** and **HOLD** modes toggled.

NOTE

- An auto power off function does not operate in the continuous measurement mode. Be sure to return to **HOLD** mode. The power goes off after 15 seconds.
- During the continuous measurement mode, the laser marker (3415-02) or LED marker (3416-02) is not turned on. (Marker is turned on whenever **MEAS** key is pressed.)

## 2.4 How to Specify the Thermal Emissivity( ε )

1. Stick black body tape on the object whose temperature is to be measured, or spray it with black body spray.
2. Set the thermal emissivity value( ε ) on the display screen to the value indicated on black body tape (black body spray).
3. Press the **MEAS** key, so as to measure the temperature ($T_{real}$) of the part on which black body tape (or black body spray) is applied.

4. Measure the temperature (T) of the parts to which black body tape (or black body spray) is not applied.
5. Change the thermal emissivity ( ε ).
6. The value of the thermal emissivity ( ε ) at which T comes out to be equal to $T_{real}$ is the correct value for the inherent thermal emissivity of the body whose temperature is to be measured.

## 2.5 Setting the Upper and Lower Alarm Temperatures

1. Press the **MODE** key, repeatedly if necessary, until the **ALM**↑ mark or the ↓**ALM** mark, as desired, appears.
2. Press the ▼ key or the ▲ key to set the temperature for the upper or lower limit alarm.

## 2.6 Displaying the Maximum and Minimum Temperatures

1. Press the **MODE** key, repeatedly if necessary, until the **MAX** mark or the **MIN** mark, as desired, appears.
2. The maximum (or minimum) temperature during measurement will be displayed on the display.

## 2.7 Switching Between Celsius and Fahrenheit

- If, with the power off, the **MEAS** key is pressed to turn the power on while the ▲ key is being held down, the temperature display will be set to show the temperature in degrees Celsius (℃).
- However if, with the power off, the **MEAS** key is pressed to turn the power on while the ▼ key is being held down, the temperature display will be set to show the temperature in degrees Fahrenheit (℉).

## 2.8 Switching On the Laser Marker Beam (3415-02)

Switch the laser marker beam on and off by pressing the ▲ key during measurement, or while the display shows **HOLD**, **MAX**, or **MIN**. While the laser marker beam is on, the mark appears in the display.

## 2.9 Turning the Power Off

The product has an auto power off function. The power goes off after 15 seconds if no control action is performed.
If you need to check the measured temperature value again, just press the **MEAS** key once.

NOTE • During measurement, the auto power off function does not operate.

## 2.10 Changing the Batteries

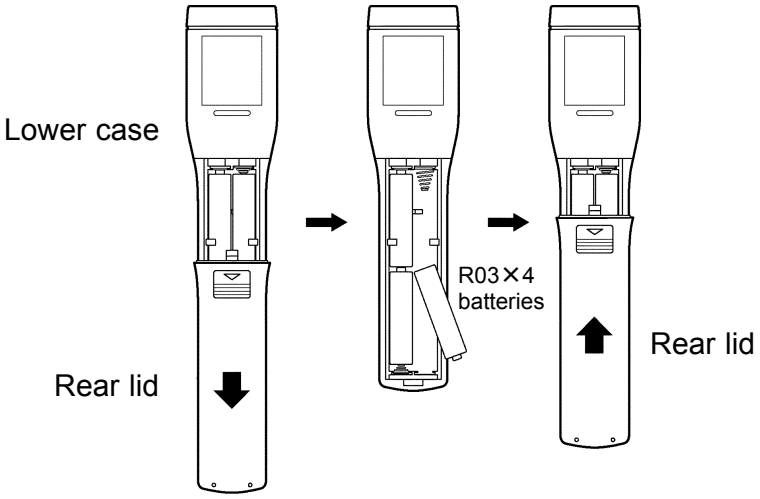
⚠ DANGER

**When changing the batteries, be careful not to press the MEAS key by mistake.**
**It is very dangerous to allow the laser beam to shine into your eyes or those of another person.**
**Also, after changing the batteries, be sure to close the cover before using the product.**

⚠ WARNING

- **Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.**
- **To avoid the possibility of explosion, do not short circuit, disassemble or incinerate batteries.**
- **Handle and dispose of batteries in accordance with local regulations.**

・Refer to the figure and follow the following procedure to change the batteries:




1. Lay the product down with the lower case (the bottom surface of the product) uppermost, and remove the rear lid.
2. Change the batteries, while being sure to put them in the right way round.
3. Close the rear lid again.

# Chapter 3 Specification

## 3.1 General Specification 3415-02

| | |
|---|---|
| Product type | 3415-02 Emission Temperature HiTester (2-beam laser marker type) |
| Measurement temperature range | -50 to 500℃ (-58 to 932 ℉) |
| Display resolution | 1℃ |
| Temperature and humidity for guaranteed accuracy | 23℃±5℃ (73℉±9℉), 80% RH or less |
| Guaranteed accuracy period | 1 year |
| Accuracy of measurement<br>201 to 500℃<br>0 to 200℃<br>-50 to -1℃ | <br>±1% rdg.<br>±2℃<br>±10%rdg. ±2℃<br>ε=1.0, temperature of case 23±5 ℃, ambient humidity 55 %rh |
| Repeatability | ±1℃ (0 to 500℃)<br>±2℃ (-50 to -1℃) |
| Diameter of field of measurement | 72 mm at 1000 mm |
| Detection element / optical lens | thermopile / silicon |
| Measurement wavelength | 8 to 16 μm |
| Sampling rate | 2 times/second |
| Response time | 1.5 seconds (95% response) |

| | |
|---|---|
| Sighting | 2-beam laser marker (class 2) |
| Thermal emissivity compensation | 0.10 to 1.00 by steps of 0.01 |
| Upper and lower limit alarm function | setting range -55 to 505℃ |
| Auto power off | 15 seconds (except when set to continuous measurement mode) |
| Other functions | Instant, hold, maximum, minimum, selectable Celsius/Fahrenheit selection |
| Power source | Four R03/AAA dry batteries (1.5 VDC×4) (Approx. 40 hours continuous operation, with laser marker not illuminated) |
| Maximum rated power | 342mVA (max.) |
| Batt-Lo light flashing voltage | 4.4±0.2V |
| Ambient temperature for use | 0 to 40℃ |
| Ambient humidity for use | 35 to 85% rh; no condensation |
| Storage temperature | -20 to 55℃; no condensation |
| Location for use | Indoor, altitude up to 2000 mm (6562 feet) |
| Dimensions | Approx. 40W×170H×36D mm Approx. 1.57"W×6.69"H×1.42"D |
| Mass | Approx. 140 g (excluding batteries) Approx. 4.9 oz.(excluding batteries) |
| Applicable standards | EMC: EN61326:1997+A1:1998+A2:2001+ A3:2003 |
| Accessories supplied | instruction manual carrying case, batteries (4 standard dry cells, R03/AAA×4) |

# 3.2 General Specification 3416-02

| | |
|---|---|
| Product type | 3416-02 Emission Temperature HiTester (LED spot marker type) |
| Measurement temperature range | -50 to 500℃ (-58 to 932 ℉) |
| Display resolution | 1℃ |
| Temperature and humidity for guaranteed accuracy | 23℃±5℃ (73℉±9℉), 80% RH or less |
| Guaranteed accuracy period | 1 year |
| Accuracy of measurement<br>201 to 500℃<br>0 to 200℃<br>-50 to -1℃ | <br>±1% rdg.<br>±2℃<br>±10%rdg. ±2℃<br>ε=1.0, temperature of case 23±5 ℃, ambient humidity 55 %rh |
| Repeatability | ±1℃ (0 to 500℃)<br>±2℃ (-50 to -1℃) |
| Diameter of field of measurement | 2.5 mm at 30 mm |
| Detection element / optical lens | thermopile / silicon |
| Measurement wavelength | 8 to 16 μm |
| Sampling rate | 2 times/second |
| Response time | 1.5 seconds (95% response) |
| Sighting | red LED spot marker |
| Thermal emissivity compensation | 0.10 to 1.00 by steps of 0.01 |

| | |
|---|---|
| Upper and lower limit alarm function | setting range -55 to 505℃ |
| Auto power off | 15 seconds (except when set to continuous measurement mode) |
| Other functions | Instant, hold, maximum, minimum, selectable Celsius/Fahrenheit selection |
| Power source | Four R03/AAA dry batteries (1.5 VDC×4) (Approx. 40 hours continuous operation, with LED marker not illuminated) |
| Maximum rated power | 180 mVA (max.) |
| Batt-Lo light flashing voltage | 4.4±0.2V |
| Ambient temperature for use | 0 to 50℃ |
| Ambient humidity for use | 35 to 85% rh; no condensation |
| Storage temperature | -20 to 55℃; no condensation |
| Location for use | Indoor, altitude up to 2000 mm (6562 feet) |
| Dimensions | Approx. 40W×170H×36D mm Approx. 1.57"W×6.69"H×1.42"D |
| Mass | Approx. 140 g (excluding batteries) Approx. 4.9 oz.(excluding batteries) |
| Applicable standards | EMC: EN61326:1997+A1:1998+A2:2001+ A3:2003 |
| Accessories supplied | instruction manual carrying case, batteries (4 standard dry cells, R03/AAA×4) |

# 3.3 General Specification 3418-01

| | |
|---|---|
| Product type | 3418-01 Emission Temperature HiTester (standard type) |
| Measurement temperature range | -50 to 500°C (-58 to 932 °F) |
| Display resolution | 1°C |
| Temperature and humidity for guaranteed accuracy | 23°C±5°C (73°F±9°F), 80% RH or less |
| Guaranteed accuracy period | 1 year |
| Accuracy of measurement<br>201 to 500°C<br>0 to 200°C<br>-50 to -1°C | <br>±1% rdg.<br>±2°C<br>±10%rdg. ±2°C<br>ε=1.0, temperature of case 23±5 °C, ambient humidity 55 %rh |
| Repeatability | ±1°C (0 to 500°C)<br>±2°C (-50 to -1°C) |
| Diameter of field of measurement | 72 mm at 1000 mm |
| Detection element / optical lens | thermopile / silicon |
| Measurement wavelength | 8 to 16 µm |
| Sampling rate | 2 times/second |
| Response time | 1.5 seconds (95% response) |
| Sighting | None |
| Thermal emissivity compensation | 0.10 to 1.00 by steps of 0.01 |

| | |
|---|---|
| Upper and lower limit alarm function | setting range -55 to 505℃ |
| Auto power off | 15 seconds (except when set to continuous measurement mode) |
| Other functions | Instant, hold, maximum, minimum, selectable Celsius/Fahrenheit selection |
| Power source | Four R03/AAA dry batteries (1.5 VDC×4) (Approx. 40 hours continuous operation) |
| Maximum rated power | 72 mVA (max.) |
| Batt-Lo light flashing voltage | 4.4±0.2V |
| Ambient temperature for use | 0 to 50℃ |
| Ambient humidity for use | 35 to 85% rh; no condensation |
| Storage temperature | -20 to 55℃; no condensation |
| Location for use | Indoor, altitude up to 2000 mm (6562 feet) |
| Dimensions | Approx. 40W×170H×36D mm Approx. 1.57"W×6.69"H×1.42"D |
| Mass | Approx. 140 g (excluding batteries) Approx. 4.9 oz.(excluding batteries) |
| Applicable standards | EMC: EN61326:1997+A1:1998+A2:2001+ A3:2003 |
| Accessories supplied | instruction manual carrying case, batteries (4 standard dry cells, R03/AAA×4) |

# Chapter 4
# Maintenance and Service


- **Adjustments and repairs should be made only by technically qualified personnel.**
- **If the protective functions of the product are damaged, either remove it from service or mark it clearly so that others do not use it inadvertently.**

**⚠ CAUTION**

- To clean the product, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- To avoid corrosion from battery leakage, remove the batteries from the product if it is to be stored for a long time.
- If the product seems to be malfunctioning, confirm that the batteries are not discharged before contacting your dealer or Hioki representative.
- When sending the product for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- If the lens is dirty, clean dust etc. off it using a camera lens cleaning tissue, blower or similar means.
- If the lens is very dirty, clean it using a cotton bud containing a small quantity of alcohol.

# 4.1 Troubleshooting

| Problem | Cause | Solution |
|---|---|---|
| No display | • Batteries exhausted, poorly contacting, or wrongly inserted. | • Change the batteries, or insert them correctly. |
| Measured temperature value peculiar | • Lens dirty | • Clean the lens. |
| | • A heat source such as a high temperature body is present close by. | • Intercept radiation from the heat source by using an insulation plate etc. |
| | • The thermal emissivity value is not appropriate. | • Set the thermal emissivity to an appropriate value. |
| The display shows "Err" | • The product is faulty. | • Contact a service facility. |

- **Service**

  If the above shown solutions fail to solve the problem, it is possible that your product is malfunctioning. Please contact your sales agent or the manufacturer to arrange for repair.

## 4.2 Questions and Answers about Measurement

Q: Why can't I measure the temperature on the other side of a glass pane?

A: Normal glass absorbs infrared radiation of the wavelength (8 to 16 μm) which this device uses for temperature measurement. Therefore this device cannot measure the temperature of an object on the other side of a glass sheet, but instead measures the temperature of the glass sheet itself.

Q: Light is shining on an object. Why can't I measure its temperature accurately?

A: Since fluorescent light includes almost no infrared radiation, it has almost no effect upon normal temperature measurement. However sunlight and incandescent lights emit radiation which includes substantial amounts of the infrared radiation used by this device for temperature measurement, and accordingly may produce significant measurement discrepancies.

Q: Why can't I measure the temperature of a gas, vapor, or flame?

A: Since gases, vapors, and flames are transparent to infrared radiation, their temperatures cannot be measured in this way.

Q: Why can't I measure temperature through rain or fog?

A: Since rain and fog reflect and absorb infrared radiation, accurate measurement through them is impossible.

Q: Doesn't the measurement distance affect the resulting measured value for temperature?

A: Air hardly absorbs at all infrared radiation of the wavelengths (8 to 16 µm) used by this device for temperature measurement. Therefore accurate temperature measurement is possible, irrespective of the measurement distance.

**HIOKI 3415-02, 3416-02, 3418-01**

**TEMPERATURE HiTESTER**

Instruction Manual

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Technical Support Section

All inquiries to International Sales and Marketing Department

81 Koizumi, Ueda, Nagano, 386-1192, Japan

TEL: +81-268-28-0562 / FAX: +81-268-28-0568

E-mail: os-com@hioki.co.jp

URL http://www.hioki.co.jp/

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HIOKI

HIOKI E. E. CORPORATION

**HEAD OFFICE**

81 Koizumi, Ueda, Nagano 386-1192, Japan
TEL +81-268-28-0562 / FAX +81-268-28-0568
E-mail: os-com@hioki.co.jp / URL http://www.hioki.co.jp/

**HIOKI USA CORPORATION**

6 Corporate Drive, Cranbury, NJ 08512, USA
TEL +1-609-409-9109 / FAX +1-609-409-9108

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