ES1-N

Measure Workpieces without Physical Contact
Non-damaging, Sanitary, and Efficient Temperature Management

- Measurement temperature -50 to 500°C and -50 to 1,000°C types are available.
- High accuracy and fast measurement with ±0.5°C reproducibility and a 0.14-second (95%) response time.
- You can use the ES1-TOOLS dedicated software (free download from our website) as a setting tool to monitor temperature and change the emissivity, moving average function, and output range.
- Full lineup of laser pointer types.

⚠ **Refer to the *Temperature Controller (Digital Controller) Common Precautions.***

Ordering Information

Type	Measurement temperature range	Target size *1	Model
Without laser pointer	-50 to 500°C *2	3 mm dia. (at a distance of 30 mm)	ES1-LP3-N
		8 mm dia. (at a distance of 100 mm)	ES1-LP10-N
		40 mm dia. (at a distance of 500 mm)	ES1-LW50-N
	-50 to 1,000°C *2	35 mm dia. (at a distance of 1,000 mm)	ES1-LW100-N
With laser pointer	-50 to 500°C *2	40 mm dia. (at a distance of 500 mm)	ES1-LW50L-N
	-50 to 1,000°C *2	35 mm dia. (at a distance of 1,000 mm)	ES1-LW100L-N

*1. This value is based on the 90% energy limit. The actual target object must be at least 1.5 times larger than this size.
*2. By default, the measurement range is 0 to 500°C, but you can change the range to -50 to +500°C or -50 to +1,000°C on the ES1-TOOLS.
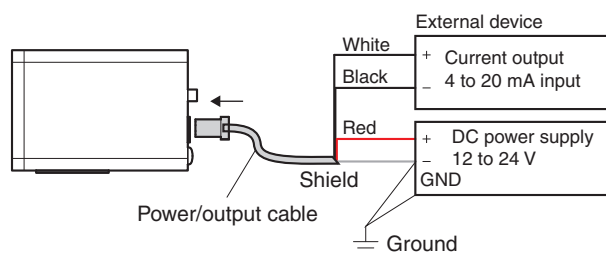
Ratings and Specifications

Type Item Model	Without laser pointer				With laser pointer	
	ES1-LP3-N	ES1-LP10-N	ES1-LW50-N	ES1-LW100-N	ES1-LW50L-N	ES1-LW100L-N
Detection element	Thermopile					
Lens	Silicon					
Measurement wavelength	8 to 14 µm					
Current output — USB output	Resolution: Approx. 0.1°C					
Current output — Current output	4 to 20 mA, -50 to 500°C *1 Load impedance: 250 Ω max. Resolution: Approx. 0.24 µA			4 to 20 mA, -50 to 1,000°C *1 Load impedance: 250 Ω max. Resolution: Approx. 0.24 µA	4 to 20mA/-50 to 500°C *1 Load impedance: 250 Ω max. Resolution: Approx. 0.24 µA	4 to 20 mA, -50 to 1,000°C *1 Load impedance: 250 Ω max. Resolution: Approx. 0.24 µA
Power supply voltage	12 to 24 VDC/USB bus power (Functions other than current output can be used with USB bus power only)					
Allowed power supply voltage fluctuation	95% to 105% of the power supply voltage					
Current consumption	30 mA max. (24 VDC)				• 30 mA max. (24 VDC, Not using laser pointer) • 40 mA max. (24 VDC, Using laser pointer)	
Cable length	2 m ±5 cm					
Measurement accuracy	USB output • Within ±(-8%rdg+1)°C (Measurement temperature: -50 to 0°C) • Within ±1°C (0 to 200°C) • Within ±0.5%rdg°C (200 to 500°C) Current output • Difference from USB output is (±0.1% of output range) °C or less			USB output • Within ±(-8%rdg+1)°C (Measurement temperature: -50 to 0°C) • Within ±1°C (0 to 200°C) • Within ±0.5%rdg°C (200 to 1,000°C) Current output • Difference from USB output is (±0.1% of output range) °C or less	USB output • Within ±(-8%rdg+1)°C (Measurement temperature: -50 to 0°C) • Within ±1°C (0 to 200°C) • Within ±0.5%rdg°C (200 to 500°C) Current output • Difference from USB output is (±0.1% of output range) °C or less	USB output • Within ±(-8%rdg+1)°C (Measurement temperature: -50 to 0°C) • Within ±1°C (0 to 200°C) Within ±0.5%rdg°C (200 to 1,000°C) Current output • Difference from USB output is (±0.1% of output range) °C or less
Reproducibility	• Within 0.5°C			• Within ±1°C (Measurement temperature: -50 to 0°C) • Within ±0.5°C (0 to 500°C) • Within ±1°C (500 to 1,000°C)	• Within 0.5°C	• Within ±1°C (Measurement temperature: -50 to 0°C) • Within ±0.5°C (0 to 500°C) • Within ±1°C (500 to 1,000°C)
Temperature drift	• Within ±0.5°C/°C (Measurement temperature: -50 to 0°C) • Within ±0.25°C/°C (Measurement temperature: 0 to 500°C)			• Within ±0.5°C/°C (Measurement temperature: -50 to 0°C) • Within ±0.25°C/°C (Measurement temperature: 0 to 500°C) • Within ±0.5°C/°C (Measurement temperature: 500 to 1,000°C)	• Within ±0.5°C/°C (Measurement temperature: -50 to 0°C) • Within ±0.25°C/°C (Measurement temperature: 0 to 500°C)	• Within ±0.5°C/°C (Measurement temperature: -50 to 0°C) • Within ±0.25°C/°C (Measurement temperature: 0 to 500°C) • Within ±0.5°C/°C (Measurement temperature: 500 to 1,000°C)
Influence of EMS *2 — Radiated electromagnetic field immunity	Within ±10°C (80 MHz to 1.0 GHz)					
Influence of EMS *2 — Immunity Conducted Disturbance	Within ±10°C (150 kHz to 80 MHz)					
Response time	Current output: 0.14 s max. (95% response, movement average of 1)					
Emissivity setting	Factory setting: 0.95: Can be changed to a value between 0.100 and 1.999 with the setting tool					
Moving average function	Factory setting: 10 Can be changed to a value between 1 and 1,000 with the setting tool			Factory setting: 50 Can be changed to a value between 1 and 1,000 with the setting tool	Factory setting: 10 Can be changed to a value between 1 and 1,000 with the setting tool	Factory setting: 50 Can be changed to a value between 1 and 1,000 with the setting tool
Operating temperature and humidity range	Temperature:0 to 55°C, Humidity:35 to 85% (without condensation)					
Storage temperature and humidity range	−20 to 55°C (without condensation)					
Vibration resistance — Malfunction	10 to 55 Hz, 20 m/s² along 3 axes for 10 min.					
Vibration resistance — Destruction	10 to 55 Hz, 0.75-mm single amplitude, along 3 axis for 2 hours					
Degree of protection	None					
Applicable safety standards	CE, KC, FCC, RCM			-	IEC60825-1, PSC, FDA	
Dimensions	L: 58, W: 32, H: 40 mm			L: 90.3, W: 32, H: 40 mm	L: 60.4, W: 32, H: 40 mm	L: 92.7, W: 32, H: 40 mm
Weight	Approx. 95 g			Approx. 115 g	Approx. 95 g	Approx. 115 g
Standard accessories	User's Manual, Mounting Brackets, Power/output cable (2 m), and Installation Gauge		User's Manual, Mounting Brackets, and Power/output cable (2 m)			

*1. By default, the measurement range is 0 to 500°C, but you can change the range to -50 to +500°C or -50 to +1,000°C on the ES1-TOOLS.
*2. Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
    Measurement error is within ±10°C.

Connection Example

White — External device
+ Current output
Black — 4 to 20 mA input
−

Red — + DC power supply
− 12 to 24 V
Shield GND
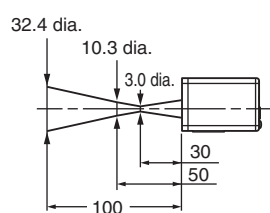
Power/output cable

Ground

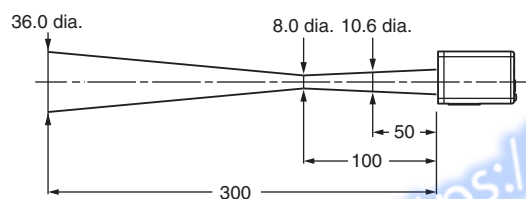## Measurement Field of View

(Unit: mm)

The target size is the diameter of the circle that is equivalent to 90% of the incident power received by the instrument. To measure accurately, the size of the object must be approximate 1.5 to 2 times the target size shown above.
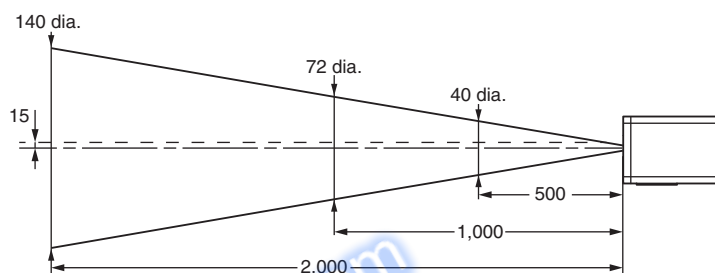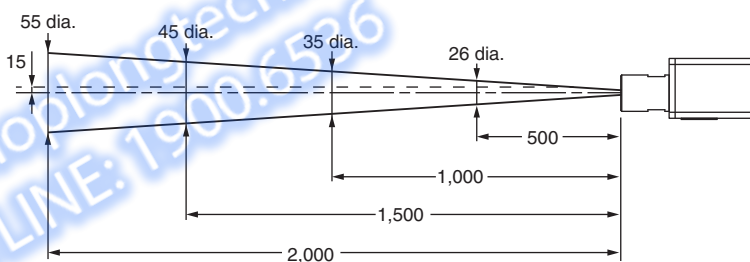
ES1-LP3-N

32.4 dia.
10.3 dia.
3.0 dia.
30
50
100

ES1-LW50-N/ES1-LW50L-N

140 dia.
72 dia.
40 dia.
15
500
1,000
2,000

ES1-LP10-N

36.0 dia.
8.0 dia. 10.6 dia.
50
100
300

ES1-LW100-N/ES1-LW100L-N

55 dia.
45 dia.
35 dia.
26 dia.
15
500
1,000
1,500
2,000

Note: Upper value is the target size, lower value is the distance.
Long and short dashes line is the center of target.
Short dashes line is the center of laser pointer.
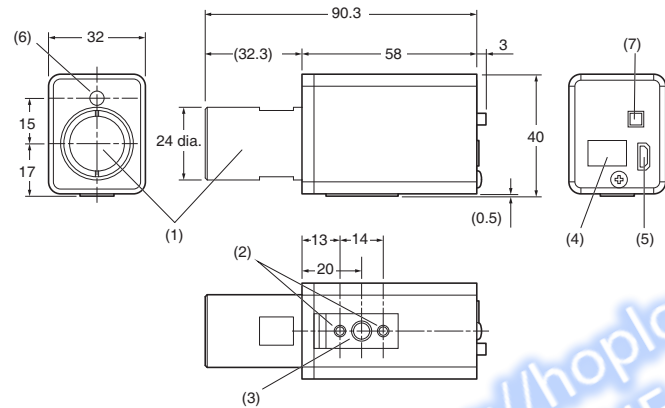
Dimensions

ES1-LP3-N/ES1-LP10-N
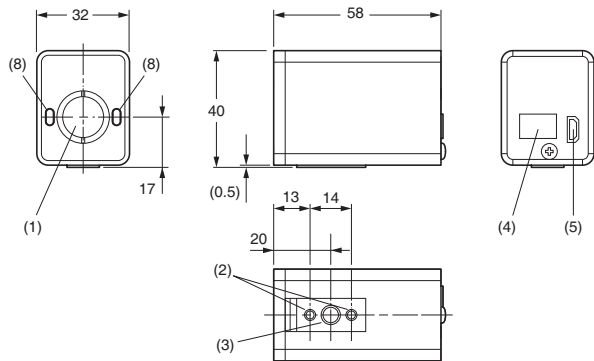
ES1-LW50-N/ES1-LW50L-N

(The ES1-LW50-N does not have the Laser output port (6) and the laser switch (7).)
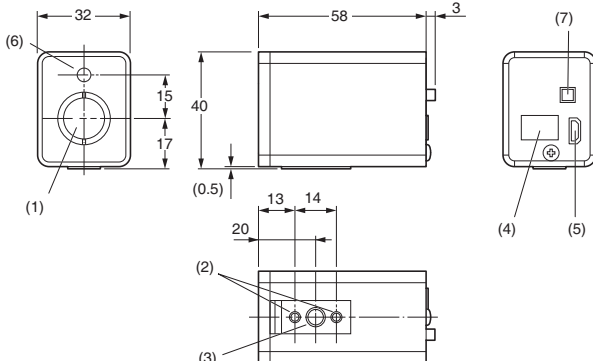
ES1-LW100-N/ES1-LW100L-N

(The ES1-LW100-N does not have the Laser output port (6) and the laser switch (7).)

No.	Name
(1)	Lens
(2)	Built-in screws for mounting bracket (M4)
(3)	Built-in screw for tripod (1/4-20UNC)
(4)	Power/output connector
(5)	Micro USB connector
(6)	Laser output port
(7)	Laser switch
(8)	Setting gauge fixing holes

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Installation

- To attach the unit to the mounting brackets, use the provided M4x6 screws. Using screws longer than 8 mm may damage the unit.
- The mounting bracket pair to which the bent way is opposite. The body can be rotated downward within the range 0° to 45° as well by exchanging the mounting brackets.
- To fasten the mounting brackets to the customer's instrument, refer to the mounting bracket dimensions shown above.
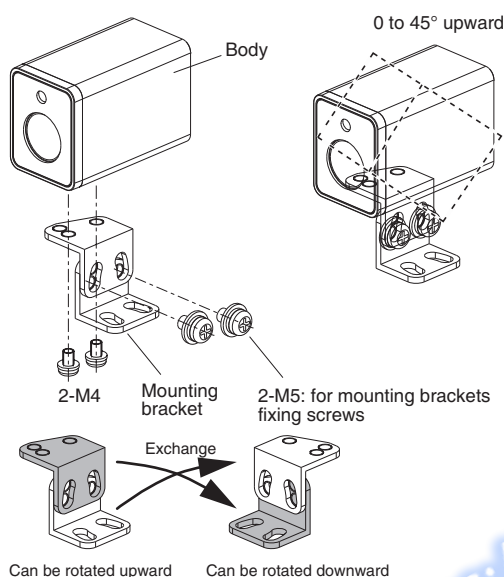
Using the tripod

Mount on the tripod using the tripod screw holes on the bottom of the unit.

Using the mounting brackets

Attach the unit to the mounting brackets using the mounting bracket screw holes on the bottom of the unit.
By combining the mounting brackets as shown below, the unit can be adjusted to any upward angle between 0 and 45°. Loosen the mounting bracket assembly screws and adjust the angle. When finished, tighten the screws.

Mounting bracket assembly example

Body

0 to 45° upward

2-M4   Mounting bracket   2-M5: for mounting brackets fixing screws

Exchange

Can be rotated upward   Can be rotated downward

Mounting bracket dimensions (top view)
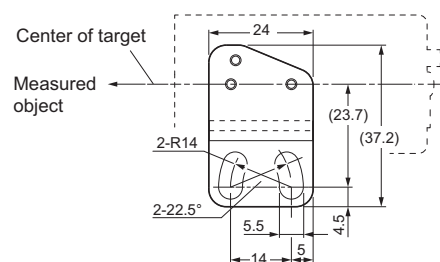
Center of target

Measured object

24

(23.7)

(37.2)

2-R14

2-22.5°

5.5

4.5

14

5

To fasten the mounting brackets to the customer's instrument, refer to the mounting bracket dimensions shown above.

The mounting bracket pair to which the bent way is opposite. The body can be rotated downward within the range 0° to 45° as well by exchanging the mounting brackets.

You can construct a total temperature management and control system by connecting this Sensor to other components.

ES1 Infrared Thermosensor

4 to 20 mA output

Temperature Controller
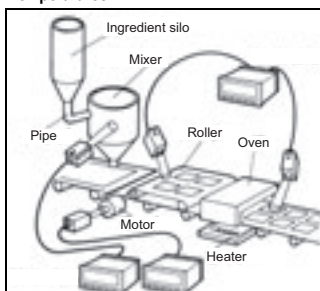E5CN-H, E5AN-H, and E5EN-H
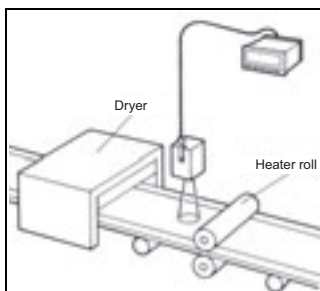
Temperature Controller
E5□C Series and E5□D series

Digital Panel Meter
K3HB-X, K3HB-S, and K3GN

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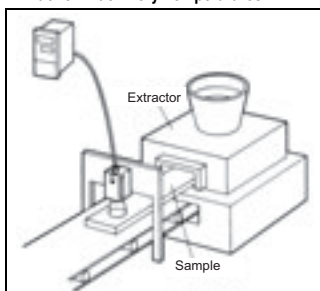
Application Examples

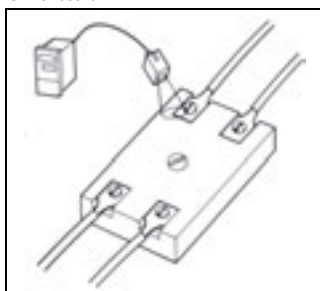**Measurement of Cookie, Biscuit, or Bread Temperatures**

Ingredient silo
Mixer
Pipe
Roller
Oven
Motor
Heater

Measurement of Injection Molding and Resin Extraction Machinery Temperatures

Extractor
Sample

Rubber or Resin Conveyor Belt Temperature Control

Conveyor belt

Bearing Heat Production

* If the measurement surface has a metallic sheen, use the optional black tape and spray.

Fiber Drying Process and Printing

Dryer
Heater roll

Checking for Poor Contacts on a Switchboard

Temperature Control during the Gluing Process of Product Manufacturing
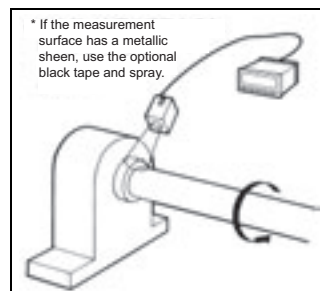
Thermal Insulation Quality Control

Thermal insulation
Coil
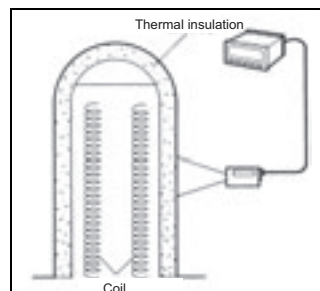
Options

Black Spray/Black Tape

Black spray: $\varepsilon = 0.94$
(Resistant to heat up to 550°C.)
Black tape: $\varepsilon = 0.95$
50 mm wide × 10 m
Thickness: 0.2 mm
(Resistant to heat up to 180°C.)
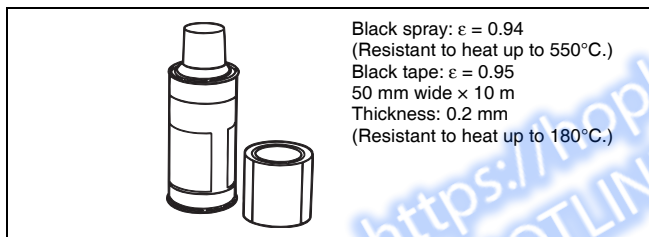
Name	Model
Black Spray	**ES1-S**
Black Tape	**ES1-T**

Use the Black Tape or Black Spray to measure the temperature of objects with a low or unknown emissivity.

Measuring Objects with Low Emissivity
1. Put Black Tape (emissivity: 0.95) on the area you want to measure the temperature of.
2. Set the emissivity of the Infrared Thermosensor to 0.95, then perform the measurement.

Measuring Objects with an Unknown Emissivity
1. Put Black Tape (emissivity: 0.95) on the area you want to measure the temperature of.
2. Set the emissivity of the Infrared Thermosensor to 0.95, then perform the measurement.
3. Remove the tape and measure the temperature. Set the emissivity on the Infrared Thermosensor so that the temperature measures the same as when the tape was on the object.

ES1-TOOLS Data Collection Software
Specifications

Supported models		ES1-N series
Functions		Monitoring and collecting measurement data, checking and changing settings (emissivity, output range lower limit, output range upper limit, moving average data count), auto emissivity setting, current output test
Usable computer	OS	Microsoft Windows 7/8/8.1/10 (32-bit, 64-bit)
	Hard disk	At least 1 GB of free space
	Display	1280 × 800 dots or higher recommended
Connection method		Connect the ES1-N to the computer using a micro USB cable ✱
Language		Japanese, English

✱ Prepare the USB cable for connecting to the PC by the customer.

You can download the ES1-TOOLS Data Collection Software for Windows computers from our website.
URL http://www.ia.omron.com
This software provides the following functions.
• Checking and changing settings
• Automatic emissivity setting
• Current output test
• Measurement data collection (maximum of 8 units can be connected)

Safety Precautions

Be sure to read the precautions for all Infrared Thermosensors in the website at: http://www.ia.omron.com/.

Key to Warning Symbols

⚠️ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.	
⚠️ **CAUTION**	Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or property damage.	

Meaning of Product Safety Symbols

⚠️	Indicates the possibility of the risk of laser beam exposure
🚫	Indicates prohibitions when there is a possibility of injury, such as from electric shock, as the result of disassembly
⚡	Indicates possibility of electric shock under specific conditions
🚫	Indicates non-specific general prohibitions
⚠️	Indicates non-specific general cautions, warnings, and dangers
⚠️	Indicates the possibility of injury by high temperature under specific conditions

Warning Symbols

⚠️ WARNING

The ES1-LW50L-N and ES1-LW100L-N contain a Class 1 laser. Never look at the laser light or allow the laser light to enter the eye. Do not allow laser light reflected from a mirror to enter the eye.

Never disassemble the product. Risk of vision impairment or blindness from laser light leakage if disassembled.

⚠️ Caution

Minor injury due to electric shock may occasionally occur. Do not touch the connections such as the temperature controller while power is being supplied.

Make sure that the product's metal enclosure is not touching the voltage-applied conductors. For touching the product's metal enclosure with bare hands, electrical shock may occur. The product's metal enclosure and internal circuits, the power supply, current output, or USB port are not isolated.

Electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, conducting wires, shavings or powder from installation work, water, or other foreign objects to enter the product.

Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.

Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

If the output relays are used past their life expectancy, burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy.

When measuring an object at high temperature, keep the sensor a sufficient distance away from the object and measure within ambient temperature.

- The setting gauge is flammable. Do not allow flame or fire near the setting gauge.
- If the object of measurement is at high temperature, do not use the setting gauge.
- Use the setting gauge only after the temperature of the object of measurement has cooled to normal temperature.

Precautions for Safe Use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Do not handle the product in way that exceed the ratings.

1. The product is designed for indoor use only. Do not use the product outdoors. Do not use or store the product in any of the following locations.
   - Places directly subject to heat radiated from heating equipment.
   - Places subject to splashing liquid or oil atmosphere.
   - Places subject to direct sunlight.
   - Places subject to intense temperature change.
   - Places subject to icing and condensation.
   - Places subject to vibration and large shocks.
   - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).

2. Use and store the Infrared Thermosensor within the rated ambient temperature and humidity. Provide forced-cooling if required.

3. Check the signal names and polarities of terminals such as those of the temperature controller, and wire correctly.

4. Allow as much space as possible between the controller and devices that generate a powerful high-frequency or surge. Separate the high-voltage or large-current power lines from other lines, and avoid parallel or common wiring with the power lines when you are wiring to the terminals.

5. Use this product within the rated load and power supply voltage.

6. Touching the lens with a hard object or applying stress to the lens may damage the lens and cause the product to malfunction. Do not touch the lens with a hard object or apply stress to the lens.

7. Never use water, detergents, or organic solvents other than absolute alcohol.

8. When disassembling the Infrared Thermosensor for disposal, use suitable tools.

9. The laser pointer uses a semiconductor laser.
   Shining the laser for an unnecessarily long time may shorten the life of the laser and cause product failure.

10. Risk of damage if pressed with excessive force. When connecting the connector, make sure the orientation is correct and connect correctly.

11. Do not connect/disconnect the USB cable during regular use. Doing so may result in malfunction or failure of the product.

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