LE250 and LE550 Analog-Discrete Laser Gauging L-GAGE® Sensor Quick Start Guide

Product Description

Laser displacement sensor with both analog and discrete (switched) outputs

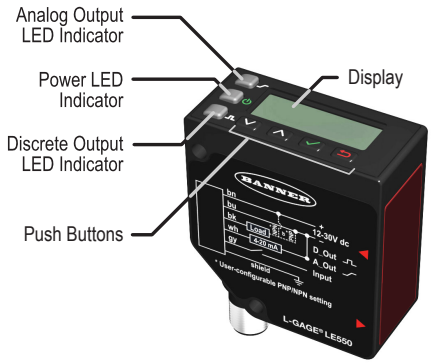
This guide is designed to help you set up and install the L-GAGE® LE Laser Gauging Sensor. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at www.bannerengineering.com. Search for p/n 175094 to view the manual. Use of this document assumes familiarity with pertinent industry standards and practices.

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Features and Indicators

LE Analog Sensor Features



Three LED indicators provide ongoing indication of the sensing status.

Analog Output LED Indicator

Solid Amber = Displayed distance is within the taught analog output window
Off = Displayed distance is outside the taught analog output window

Power LED Indicator

Solid Green = Normal operation, power On and laser On
Flashing Green (1 Hz) = Power On and laser Off (laser enable mode)

Discrete Output LED Indicator

Solid Amber = Discrete Output is On
Off = Discrete Output is Off

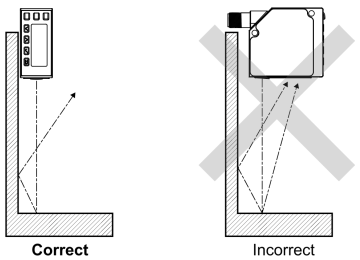
Sensor Installation

NOTE: Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow the window clear using filtered, compressed air, then clean as necessary using 70% isopropyl alcohol and cotton swabs or water and a soft cloth.

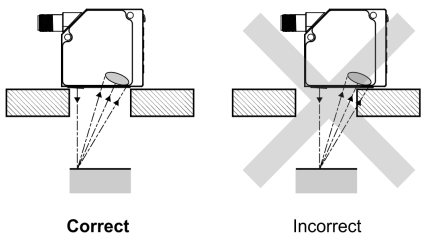
Sensor Orientation

Correct sensor-to-object orientation is important to ensure proper sensing. See the following figures for examples of correct and incorrect sensor-to-object orientation as certain placements may pose problems for sensing distances.

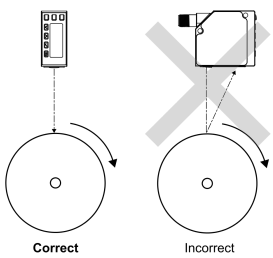
Orientation by a wall



Orientation in an opening



Orientation for a turning object



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Original Instructions
16-Jul-25

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175093
p/n: 175093 Rev. F

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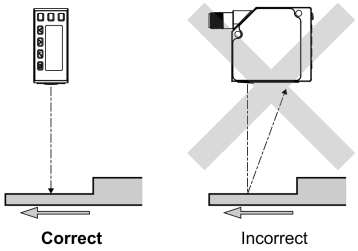
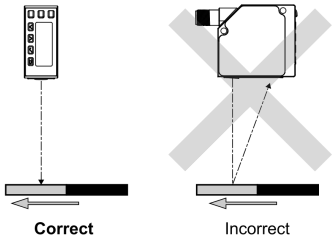
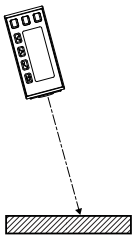
Orientation for a height difference



Orientation for a color or luster difference



Orientation for a highly reflective target



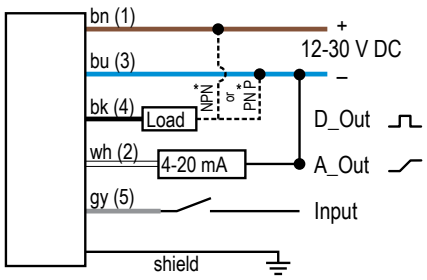
Applying tilt to sensor may improve performance on reflective targets. The direction and magnitude of the tilt depends on the application, but a 15° tilt is often sufficient.

Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

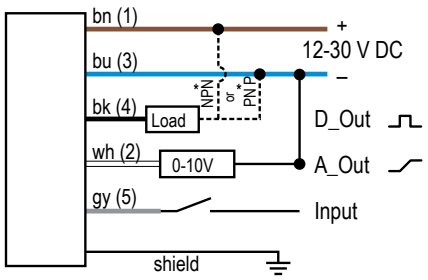
Wiring Diagrams

Analog Current Model



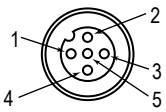
* User-configurable PNP/NPN setting

Analog Voltage Model



* User-configurable PNP/NPN setting

Key



1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray

LE Laser Display

LE550 Display in Run Mode

The display is a 2-line, 8-character LCD. The main screen is the Run mode screen, which shows the real-time distance measurement and the analog output measurement.

Buttons

Use the sensor buttons **Down**, **Up**, **Enter**, and **Escape** to program the sensor and to access sensor information.

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Down and Up Buttons

Press **Down** and **Up** to:
- Access the Quick Menu from Run mode
- Navigate the menu systems
- Change programming settings

When navigating the menu systems, the menu items loop.

Press **Down** and **Up** to change setting values. Press and hold the buttons to cycle through numeric values. After changing a setting value, it slowly flashes until the change is saved using the **Enter** button.

Enter Button

Press **Enter** to:
- Access the Sensor Menu from Run mode
- Access the submenus
- Save changes

In the Sensor Menu, a checkmark in the lower right corner of the display indicates that pressing **Enter** accesses a submenu.

Press **Enter** to save changes. New values flash rapidly and the sensor returns to the parent menu.

Escape Button

Press **Escape** to:
- Leave the current menu and return to the parent menu
- Return to Run mode from the Quick Menu

IMPORTANT: Pressing **Escape** discards any unsaved programming changes.

In the Sensor Menu, a return arrow in the upper left corner of the display indicates that pressing **Escape** returns to the parent menu.

Press and hold **Escape** for 2 seconds to return to Run mode from any menu or remote teach.

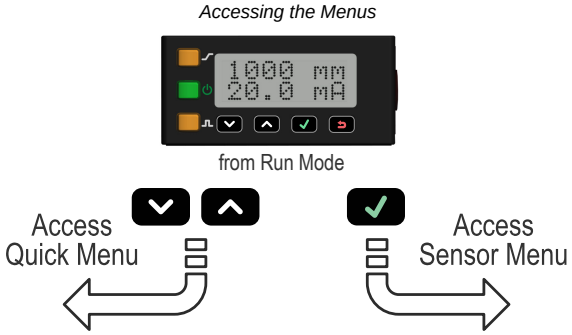
LE Laser Sensor Programming

Program the sensor using the buttons on the sensor or the remote input (limited programming options).

From Run mode, use the buttons to access the Quick Menu and the Sensor Menu. See "Quick Menu" on page 3, "Sensor Menu (MENU)" on page 4, and the instruction manual (p/n 175094) for more information on the options available from each menu. For TEACH options, follow the TEACH instructions in the instruction manual.

In addition to programming the sensor, use the remote input to disable the buttons for security, preventing unauthorized or accidental programming changes. See the instruction manual for more information.

Accessing the Menus



Quick Menu

The sensor includes a Quick Menu with easy access to view and change the analog and discrete output switch points. Access the Quick Menu by pressing **Down** or **Up** from Run mode. When in the Quick Menu, the current distance measurement displays on the first line and the menu name and the analog value alternate on the second line of the display. Press **Enter** to access the switch points. Press **Down** or **Up** to change the switch point to the desired value. Press **Enter** to save the new value and return to the Quick Menu.

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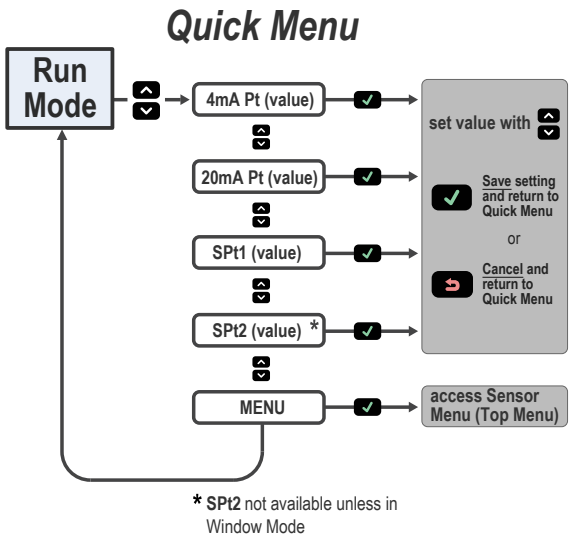
Quick Menu Map (Window Mode)



Sensor Menu (MENU)

Access the Sensor Menu by pressing **Enter** from Run mode. The Sensor Menu is also accessible from the Quick Menu: navigate to **MENU** and press **Enter**. The Sensor Menu includes several submenus that provide access to view and change sensor settings and to view sensor information.

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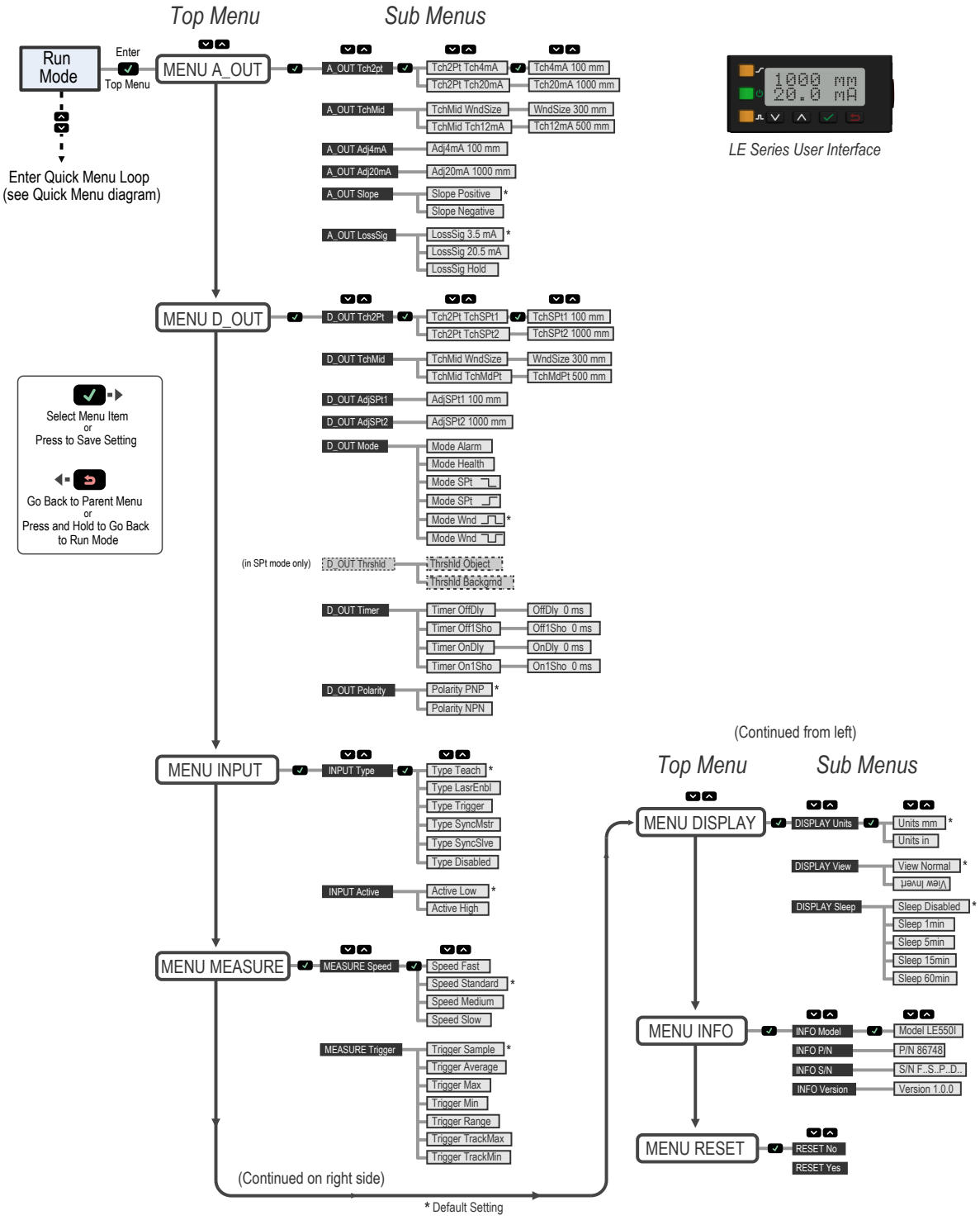
LE550 Sensor Menu Map



LE Series User Interface

Specifications

Supply Voltage (Vcc)
12 V DC to 30 V DC

Power and Current Consumption, exclusive of load
Normal Run Mode: 1.7 W, Current consumption < 70 mA at 24 V DC

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Supply Protection Circuitry

Protected against reverse polarity and transient overvoltages

Output Configuration

Analog output: 4 to 20 mA or 0 to 10 V, depending on model

Discrete output rating: Discrete NPN/PNP is user-configurable

Output Ratings

Discrete Output: 100 mA maximum (protected against continuous overload and short circuit)

OFF-state leakage current—PNP: < 10 µA at 30 V

OFF-state leakage current—NPN: < 200 µA at 30 V

Output saturation voltage—PNP outputs: < 3 V at 100 mA

Output saturation voltage—NPN outputs: < 1.6 V at 100 mA

Analog current output (LE...I Models):1 kΩ max. @ 24 V; max. load resistance = [(Vcc-4.5)/0.02 Ω]

Analog voltage output (LE...U Models): 2.5 kΩ min. load resistance

Remote Input

Allowable Input Voltage Range: 0 to Vcc

Active Low (internal weak pullup—sinking current):

· High State > 4.3 V at 740 µA max.

· Low State < 1.3 V at 800 µA max.

Active High (internal weak pulldown—sourcing current):

· High State > 4.3 V at 1.7 mA max.

· Low State < 1.3 V at 1.6 mA max.

Analog Resolution

LE250: 100 mm to 250 mm: Less than 0.02 mm

LE250: 250 mm to 400 mm: Less than 0.2 mm

LE550: 100 mm to 600 mm: Less than 0.5 mm

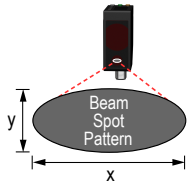
LE550: 600 mm to 1000 mm: Less than 1 mm

Analog Linearity

LE250: Linearity is the less of Accuracy or 0.3% of full scale range (± 0.9 mm) at any given distance

LE550: Linearity is the lesser of Accuracy or 0.5% of full scale range (± 4.5 mm) at any given distance

Typical Beam Spot Size[1]



	Distance (mm)					
	LE250 Models			LE550 Models		
	100	250	400	100	550	1000
x	3.2	2.1	1.2	8.4	10.5	12.1
y	2.2	1.5	0.9	3.5	4.2	4.9

Environmental Rating

IP67, NEMA 6

Operating Conditions

Temperature: –20 °C to +55 °C (–4 °F to +131°F)

Humidity: 90% at +55 °C maximum relative humidity (non-condensing)

Storage Temperature

–30 °C to +65 °C (–22 °F to +149 °F)

Application Note

For optimum performance, allow 10 minutes for the sensor to warm up

[1] Beam spot size is calculated as 1.6 times the D4σ measured value

Certifications

Industrial Control Equipment 3TJJ

UL Environmental Rating: Type 1

Sensing Beam

Class 2 laser models: visible red, 650 nm

Class 1 laser models: visible red, 650 nm

Sensing Range

LE250: 100 mm (3.94 in) to 400 mm (15.75 in)

LE550: 100 mm (3.94 in) to 1000 mm (39.37 in)

Delay at Power Up

2 s

Measurement/Output Rate

Class 2 laser models: < 1 ms

Class 1 laser models (fast): < 1 ms

Class 1 laser models (std/med/slow): < 2 ms

Ambient Light Immunity

Class 2 laser models: > 10,000 lux

Class 1 laser models: > 5,000 lux

Minimum Window Size, Analog and Discrete

LE250: 1 mm (0.039 in)

LE550: 10 mm (0.39 in)

Boresighting

LE250: 4 mm radius at 400 mm

LE550: 1 cm radius at 1 m

Maximum Torque

2 N·m (17.7 in-lbs)

Repeatability

See *Performance Curves*

Temperature Effect

See *Performance Curves*

Accuracy

See *Performance Curves*

Construction

Housing: die-cast zinc

Window: acrylic

Vibration/Mechanical Shock

All models meet Mil. Std. 202 G requirements method 201A. Also meets IEC 60947-5-2.

Response Time

	Class 1 Laser Models	Class 2 Laser Models
Fast [2]	2 ms	2 ms
Standard	10 ms	5 ms
Medium	30 ms	15 ms
Slow	100 ms	50 ms

[2] Response time for lateral entry of object into measurement range < 5 ms

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Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

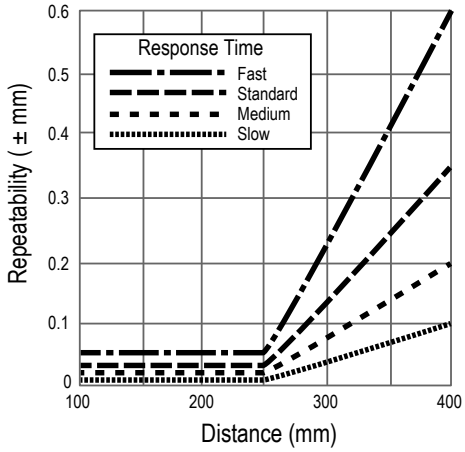
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	1.0	30	0.5

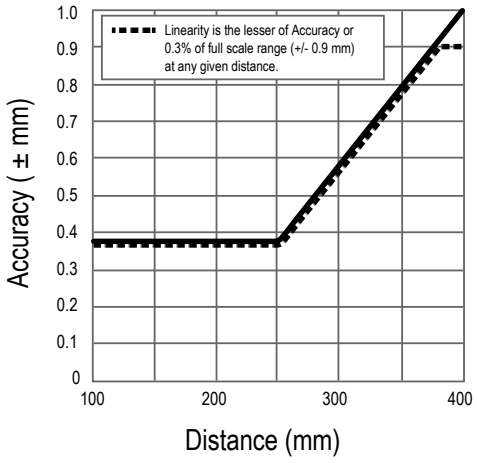
Performance Curves

LE250 Models

Repeatability (90% to 6% reflectance)

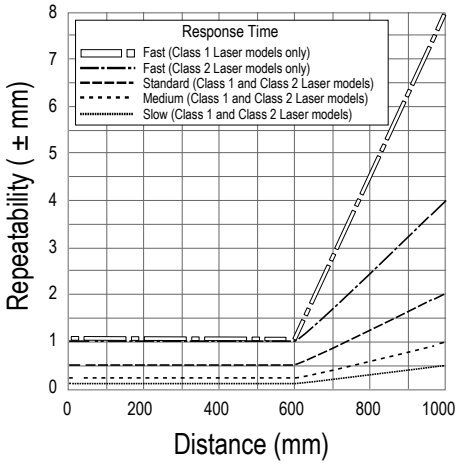


Accuracy (90% to 6% reflectance)

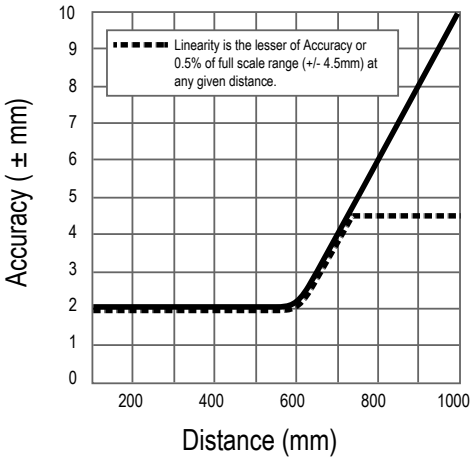


LE550 Models

Repeatability (90% to 6% reflectance)



Accuracy (90% to 6% reflectance)



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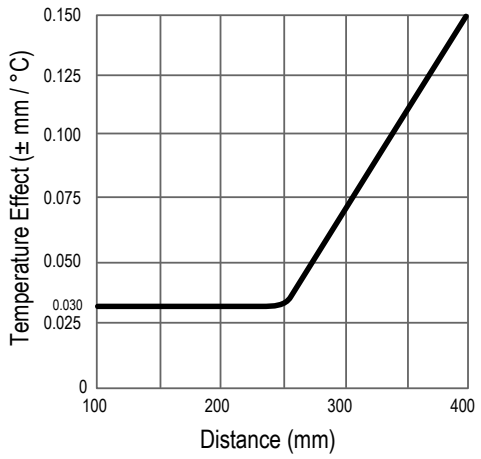
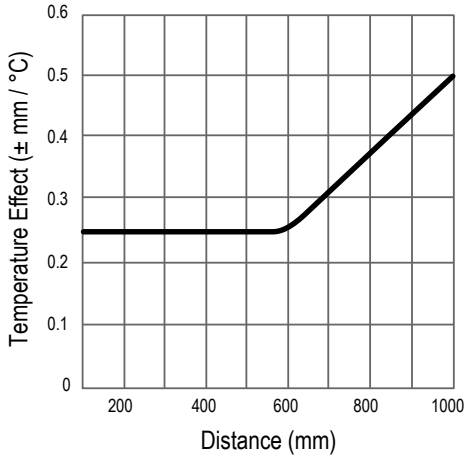
LE250 Models	LE550 Models
Temperature Effect  	*Temperature Effect* 

Class 1 Laser Description and Safety Information

Laser light. Do not stare into the beam.

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 56, dated May 8, 2019.

CLASS 1
LASER PRODUCT

CAUTION:
- **Never stare directly into the sensor lens.**
- Laser light can damage your eyes.
- Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.

CAUTION:
- **Return defective units to the manufacturer.**
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer.

CAUTION:
- **Ne regardez jamais directement la lentille du capteur.**
- La lumière laser peut endommager la vision.
- Évitez de placer un objet réfléchissant (de type miroir) dans la trajectoire du faisceau. N'utilisez jamais de miroir comme cible rétro-réfléchissante.

CAUTION:
- **Tout dispositif défectueux doit être renvoyé au fabricant.**
- L'utilisation de commandes, de réglages ou de procédures autres que celles décrites dans le présent document peut entraîner une exposition dangereuse aux radiations.
- N'essayez pas de démonter ce capteur pour le réparer. Tout dispositif défectueux doit être renvoyé au fabricant.

Class 1 lasers are lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

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For safe laser use:

- Do not stare at the laser.
- Do not point the laser at a person's eye.
- Mount open laser beam paths either above or below eye level, where practical.
- Terminate the beam emitted by the laser product at the end of its useful path.

Class 1 Laser Characteristics

Output power: <0.22 mW
Laser wavelength: 650 nm
Pulse duration: 150-900 µs

Class 2 Laser Description and Safety Information

Laser light. Do not stare into the beam.

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 56, dated May 8, 2019.

CLASS 2
LASER PRODUCT

CAUTION:

- **Never stare directly into the sensor lens.**
- Laser light can damage your eyes.
- Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.

CAUTION:

- **Return defective units to the manufacturer.**
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer.

CAUTION:

- **Ne regardez jamais directement la lentille du capteur.**
- La lumière laser peut endommager la vision.
- Évitez de placer un objet réfléchissant (de type miroir) dans la trajectoire du faisceau. N'utilisez jamais de miroir comme cible rétro-réfléchissante.

CAUTION:

- **Tout dispositif défectueux doit être renvoyé au fabricant.**
- L'utilisation de commandes, de réglages ou de procédures autres que celles décrites dans le présent document peut entraîner une exposition dangereuse aux radiations.
- N'essayez pas de démonter ce capteur pour le réparer. Tout dispositif défectueux doit être renvoyé au fabricant.

Class 2 lasers are lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

Class 2 Laser Safety Notes. Low-power lasers are, by definition, incapable of causing eye injury within the duration of a blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 nm to 700 nm). Therefore, an ocular hazard may exist only if individuals overcome their natural aversion to bright light and stare directly into the laser beam.

For safe laser use:

- Do not stare at the laser.
- Do not point the laser at a person's eye.
- Mount open laser beam paths either above or below eye level, where practical.
- Terminate the beam emitted by the laser product at the end of its useful path.

IMPORTANT: This laser device is not bore-sighted.

Class 2 Laser Characteristics

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Output power: <1 mW
Laser wavelength: 650 nm
Pulse duration: 150-400 µs

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