LE250 and LE550 IO-Link Laser Gauging L-GAGE® Sensor Quick Start Guide

Product Description

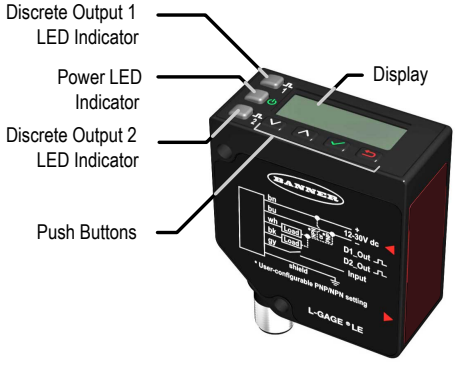
This guide is designed to help you set up and install the L-GAGE® LE Laser Gauging Sensor. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at www.bannerengineering.com. Search for p/n 194205 to view the manual. 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 IO-Link Sensor Features



Three LED indicators provide ongoing indication of the sensing status.

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 Indicators

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

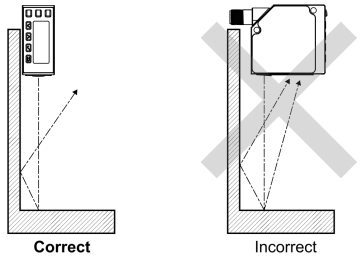
Sensor Installation

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.

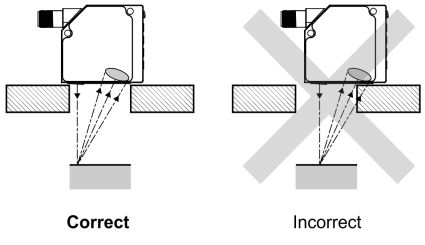
Sensor Orientation

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.

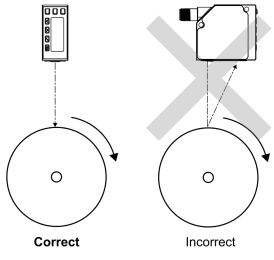
Orientation by a wall



Orientation in an opening



Orientation for a turning object



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Original Instructions
16-Jul-25

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194204
p/n: 194204 Rev. C

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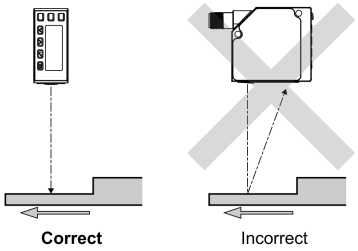
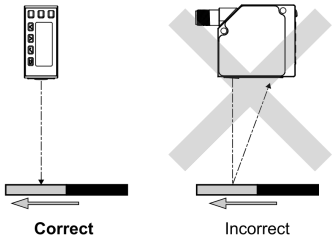
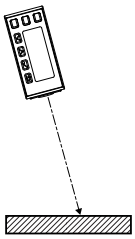
Orientation for a height difference



Orientation for a color or luster difference



Orientation for a highly reflective target



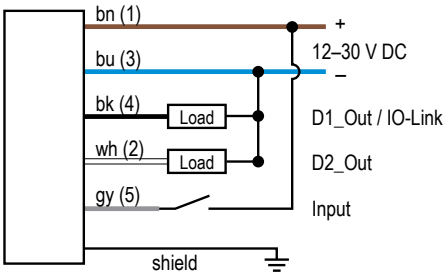
Applying tilt to sensor may improve performance on reflective targets. The direction and magnitude of the tilt depends on the application, but a 15° tilt is often sufficient.

Mount the Device

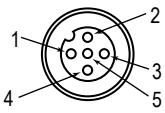
1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or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

Wiring Diagrams

IO-Link Models



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.

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.

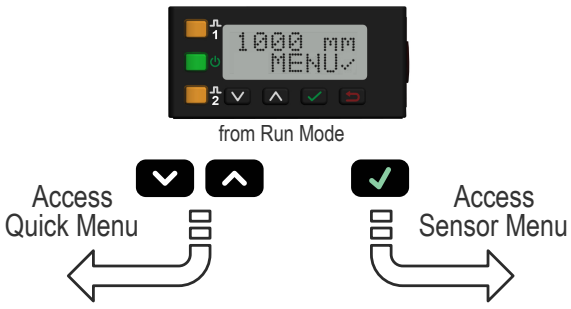
LE Laser Sensor Programming

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 194205) 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 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 discrete output switch points alternate on the second line of the display. Press **Enter** to access the switch

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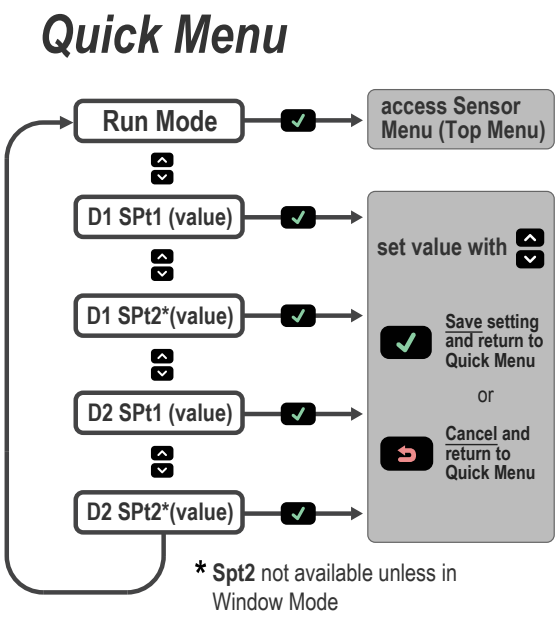
points. Press **Down** or **Up** to change the switch point to the desired value. Press **Enter** to save the new value and return to the Quick Menu.

Quick Menu Map (Window Mode)



Sensor Menu (MENU)

Access the Sensor Menu by pressing **Enter** from Run mode, when MENU is displayed. The Sensor Menu includes several submenus that provide access to view and change sensor settings and to view sensor information.

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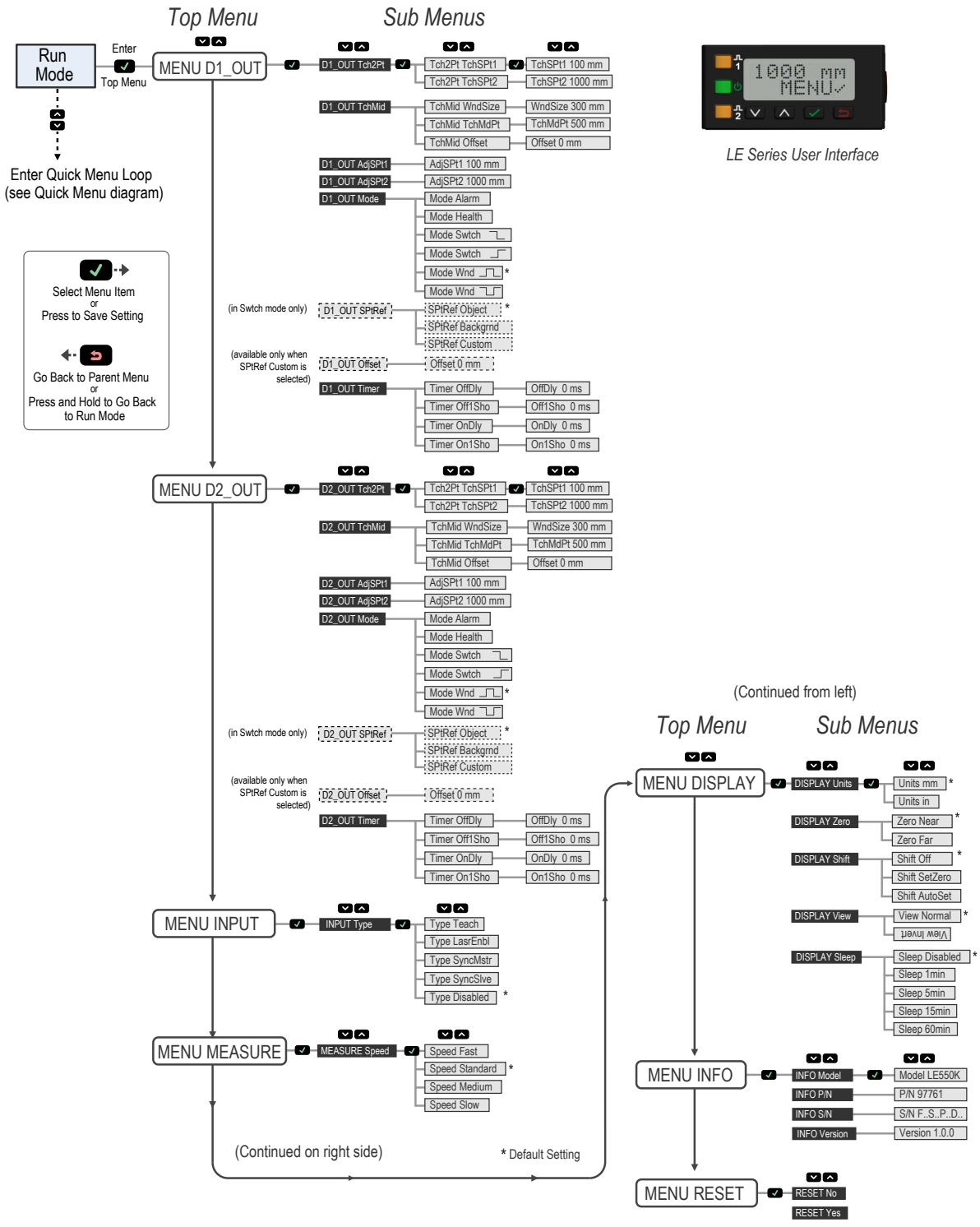
LE550 Sensor Menu Map



LE Series User Interface

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

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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.

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.



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.

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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

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

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

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Output Configuration
D1_Out: IO-Link, Push/pull
D2_Out: PNP

Output Ratings
100 mA maximum capability each output
Saturation: Less than 2 V
Off-State Leakage Current: Less than 50 µA PNP at 30 V (N.A. push/pull)

Remote Input
Allowable Input Voltage Range: 0 to Vcc
Active High (internal weak pulldown—sourcing current):
High State > Vcc – 1.5 V DC
Low State < Vcc – 5 V DC
Input Impedance > 10 kOhm

Measurement/Output Rate
Class 2 Laser Models: < 1 ms
Class 1 Laser Models (Fast): < 1 ms
Class 1 Laser Models (Std/Medium/Slow): < 2 ms

IO-Link Interface
Supports Smart Sensor Profile: Yes
Baud Rate: 38400 bps
Process Data Widths: 32 bits
IODD files: Provides all programming options of the display, plus additional functionality

Environmental Rating
IP67, NEMA 6

Operating Conditions
–20 °C to +55 °C (–4 °F to +131°F)
90% at +55 °C maximum relative humidity (non-condensing)

Storage Temperature
–30 °C to +65 °C (–22 °F to +149 °F)

Sensing Beam
Class 2 laser models: visible red, 650 nm
Class 1 laser models: visible red, 650 nm

Sensing Range
LE250: 100 mm to 400 mm (3.94 to 15.75 inches)
LE550: 100 mm to 1000 mm (3.94 to 39.37 inches)

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Minimum Window Size

LE250: 1 mm (0.039 inches)

LE550: 10 mm (0.39 inches)

Boresighting

LE250: 4 mm radius at 400 mm

LE550: 1 cm radius at 1 m

Maximum Torque

2 N·m (17.7 in-lbs)

Indicators

Power LED Indicator

Solid Green = Normal operation, power On and laser On

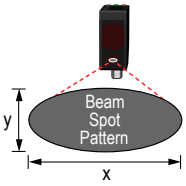
Flashing Green (1 Hz) = Power On and laser Off (laser enable mode)

Discrete Output LED Indicator

Solid Amber = Discrete Output is On

Off = Discrete Output is Off

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

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

Construction

Housing: die-cast zinc

Window: acrylic

Ambient Light Immunity

Class 2 laser models: > 10,000 lux

Class 1 laser models: > 5,000 lux

Delay at Power Up

3 s

Repeatability

See *Performance Curves*

Temperature Effect

See *Performance Curves*

Vibration/Mechanical Shock

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

Application Note

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

Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

Industrial Control Equipment 3TJJ

UL Environmental Rating: Type 1

IO-Link®

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

[1] Beam spot size is calculated as 1.6 times the D4σ measured value
[2] Response time for lateral entry of object into measurement range < 5 ms

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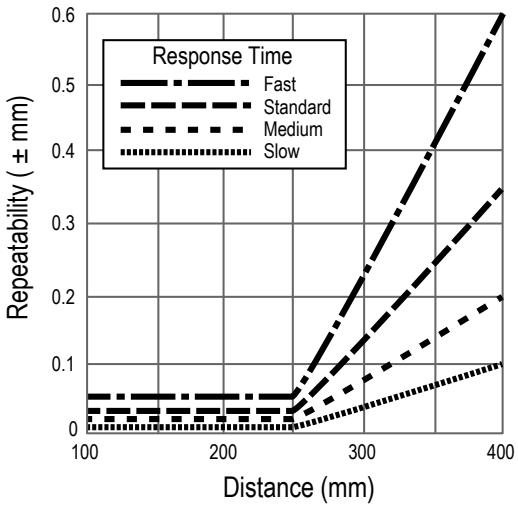
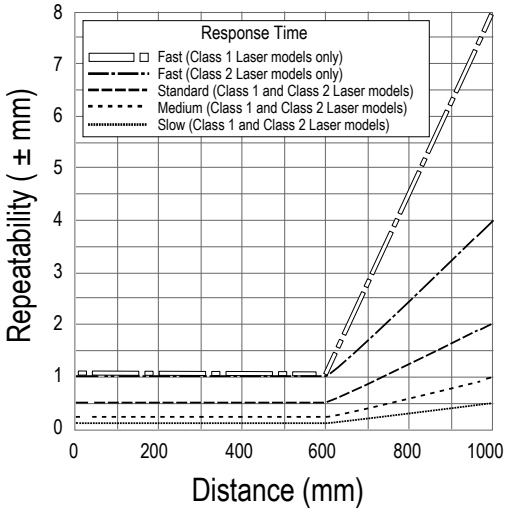
Performance Curves

LE250 Dual Discrete Models	LE550 Dual Discrete Models

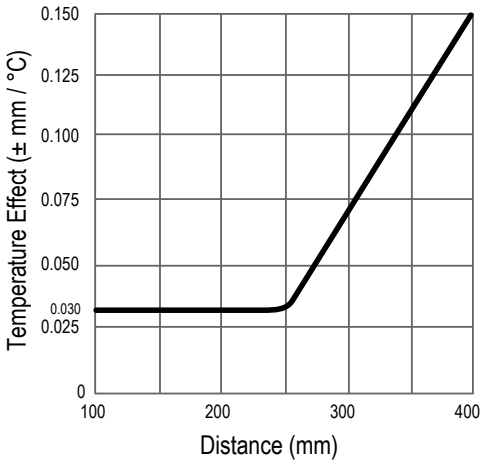
Repeatability (90% to 6% reflectance)



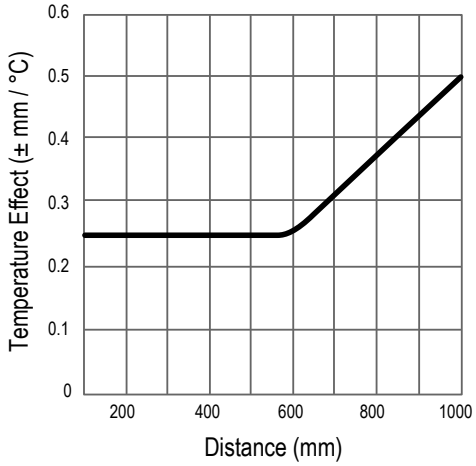
Repeatability (90% to 6% reflectance)



Temperature Effect



Temperature Effect



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