



**BANNER**<sup>®</sup>

more sensors, more solutions

**L-GAGE<sup>®</sup> LT3**

**Long-Range Time-of-Flight  
Laser Distance-Gauging Sensors**

# L-GAGE® LT3: Exceptional accuracy at unprecedented ranges.

## Advanced time-of-flight technology at less cost.

The L-GAGE LT3 Laser Distance-Gauging Sensor utilizes “time-of-flight” technology to provide precise, long-distance gauging at the speed of light. The microprocessor-controlled laser distance-gauging sensor features a unique design that provides exceptional accuracy and range at much lower cost than competitive laser-gauging devices. Precise performance and low price make the LT3 an ideal solution for a variety of precision inspection applications.

## Accurate diffuse-mode models with ranges to 5 m (16.4') and up to 1 mm (0.04") resolution.

LT3 laser distance-gauging devices provide exceptional sensing ranges and gauging accuracy. Diffuse mode models offer ranges of 0.3 to 3 m (1'-9.8') for gray targets, and 0.3 to 5 m (1'-16.4') for white targets. LT3 sensors also provide an extraordinary resolution of up to 1 mm (0.04"), depending on response speed selected and target material color.

## Achieve 50 m (164') range with retroreflective models.

Now you can perform accurate positioning at extremely long ranges. LT3 retroreflective models can accurately measure distances up to 50 m (164') while still maintaining an extremely high resolution up to 3 mm (0.12").

## One million pulses per second!

The LT3 is controlled by an advanced microprocessor that pulses its laser beam one million times per second and averages 1,000 pulses every 0.001 second to provide precise inspection data. “Time-of-flight” technology enables the sensor to precisely time the laser beam’s travel from the sensor to the target and back again.

## Reliable detection of angled targets.

The LT3 reliably senses difficult and non-perpendicular targets that ultrasonics can't detect.

## Analog & discreet outputs, or dual discrete models.



The LT3 can include both a discrete (switched) output and an analog output in the same unit, with independently programmable window limits. For additional flexibility, the analog output is available in a choice of 4 to 20 mA or 0 to 10V. You can also choose models with two discrete outputs, selectable PNP (sourcing) or NPN (sinking).

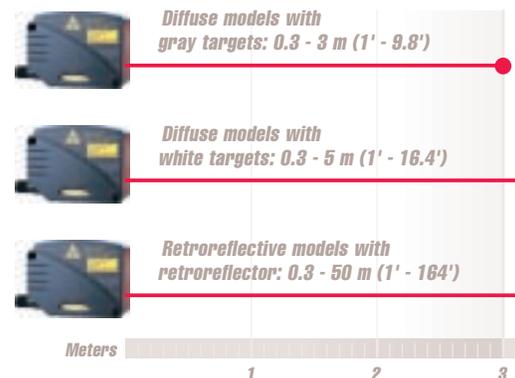


## Compact, self-contained design.

The LT3 was designed to conserve production space and decrease setup time. The self-contained system measures just 68.5 mm (2.70") high, by 35.3 mm (1.38") wide, by 86.2 mm (3.39") deep, allowing it to fit and function in smaller spaces than competitive systems.



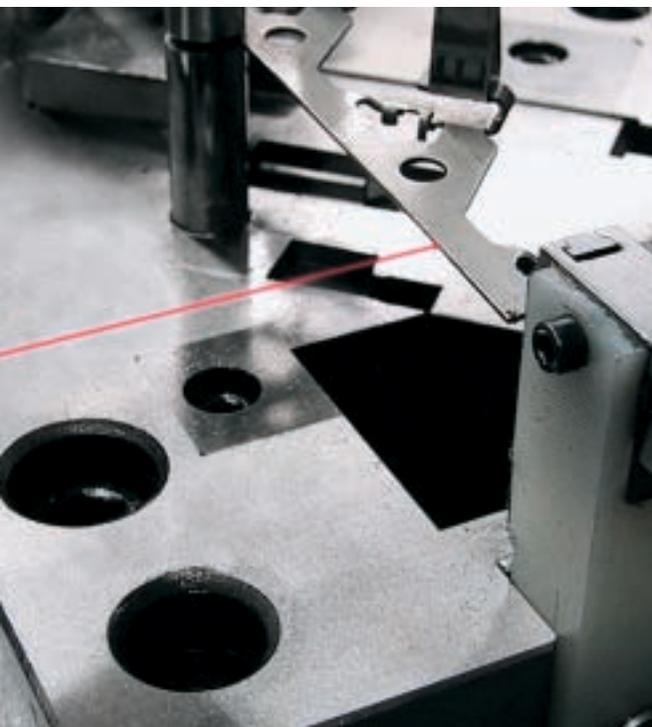
## LT3 Sensing Ranges



## L-GAGE® LT3: The most advanced laser sensor is also the simplest to use.

### Push-button TEACH programming sets custom sensing windows.

Push-button programming simplifies LT3 configuration. In TEACH mode, with a single push button, you can program a custom sensing window (size and position) or a unique set-point threshold centered within a 1 m (3.3') window. The variable signal provided by the sensor's analog output is proportional to the target's position within the programmed window limits. The discrete output energizes whenever the target is located between the user-programmed discrete window limits. Window limits for the analog and discrete outputs may be the same and set simultaneously, or they may be programmed independently. The analog output slope can be positive or negative, depending on which window limit is programmed first.



### Simple 3-step programming

LT3 programming is as easy as 1, 2, 3, and complete programming instructions (3 short sentences) are printed on the side of the sensor so you'll never lose them.

### Remote programming.

For added security and convenience, the LT3 can also be programmed from a remote location. Remote TEACH mode programming can be achieved with an external switch, computer or controller. The sensor's remote lockout feature enables you to disable the sensor's integral keypad from a remote location to discourage tampering.



# L-GAGE® LT3: Complete control & diagnostics at your fingertips.



## Scalable analog output.

The LT3 features a scalable analog output that allows you to optimize the sensor's performance automatically by scaling the analog output evenly over the width of your programmed sensing window. The scalable output reduces setup time and maximizes resolution in electrically noisy environments. The sensor's Auto-Zero feature enables you to set a sensing distance set point centered within a 1 m (3.3') wide window, quickly and easily.

## Programmable response times.

Programmable output response speeds offer increased sensing flexibility. With the push of a single button, you can select a 1, 10, or 100-millisecond response time for diffuse models.

*Yellow Speed LED: indicates selected response speed setting*

- Fast LED: 1 ms response (diffuse)
- Medium LED: 10 ms response (diffuse)
- Slow LED: 100 ms response (diffuse)

*Analog/Discrete TEACH buttons*

## Advanced diagnostics.

The LT3's advanced diagnostic indication system utilizes highly visible LEDs to keep you constantly informed of programming and operating status. The discrete output can be programmed to detect a missing target, if desired.



*Yellow Output LED: indicates when discrete load output is conducting*

*Red Signal LED: indicates target is within sensing range, and condition of received light signal*

*Red/Green TEACH LEDs: indicate sensor readiness for programming each limit (analog, discrete, or simultaneous analog and discrete)*

*Green Power LED: indicates "Power ON", overloaded output and laser status*

## Ambient light immunity.

Designed to resist interference, the LT3's modulated laser beam and narrow optical band pass filter make it highly immune to interference from ambient light, including high-energy factory lighting.



## Pre-wired or 180° rotatable, 12-24V dc.

The 12 to 24V dc LT3 is available with a 2 m or 9 m (6.5' or 30') 7-conductor shielded PVC-jacketed attached cable; or a Euro-style, 8-pin, swivel quick-disconnect fitting that allows mounting the sensor or positioning the cable at any angle. Keyed connectors prevent wiring errors.



## Durable construction.

Protected by a molded ABS/polycarbonate housing with an acrylic lens, the rugged LT3 is rated IP67 and NEMA 6 and operates in temperatures from 0 C° to +50° C (+32° F to +122° F).



## Protected circuitry.

Integral circuitry and advanced digital filtering protect LT3 sensors from reverse polarity, transient voltage, and random or electrical noise.



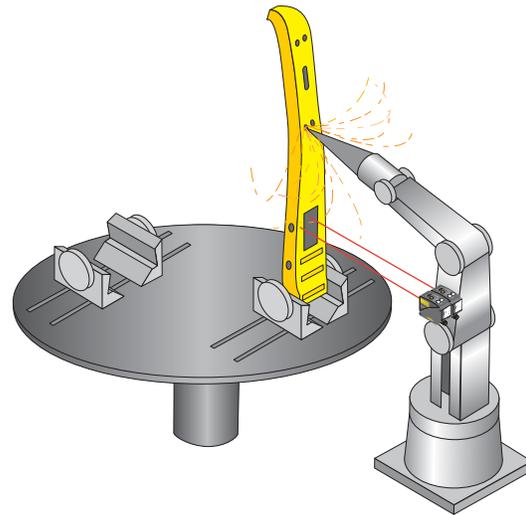
## L-GAGE® LT3 Laser Sensor Applications

### ERROR-PROOFING LASER CUTTING OPERATION

**Objective:** To verify that holes cut into a chassis are properly positioned.

**Sensor:** LT3 diffuse-mode sensor with discrete outputs.

**Operation:** A robotic laser-cutting process is used to cut openings in automotive chassis sections. As soon as a section is cut out, the LT3 inspects the region to verify that the hole is in its proper place. Because the sensor cannot be located within the robot's range of motion, the LT3's long operating range is vital for this process.

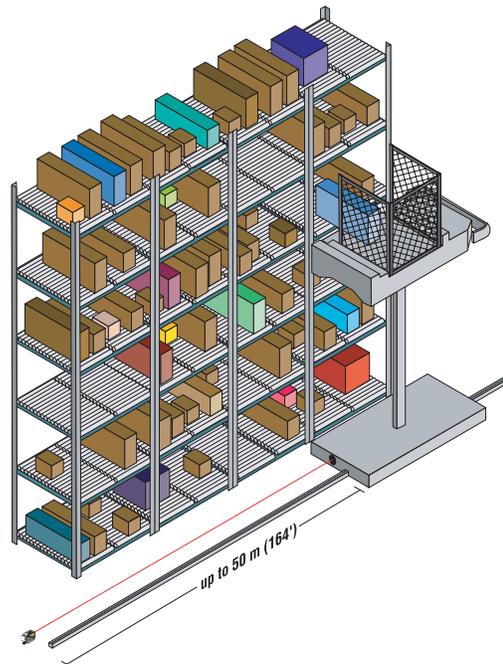


### STORAGE AND RETRIEVAL SYSTEM POSITIONING

**Objective:** To locate the position of an automated storage and retrieval system (AS/RS).

**Sensor:** LT3 retroreflective-mode sensor with analog/discrete outputs and included retroreflective target.

**Operation:** A measurement technique is required to accurately locate the position of the vertical lift unit of an automated storage and retrieval system as it moves back and forth on its path. The distance to the unit can range up to 50 m (164'). The included retroreflective target is mounted on the facing edge of the unit, in the sight path of the sensor. The class 1 laser sensor can accurately measure the distance to the target, up to 50 m (164') away.

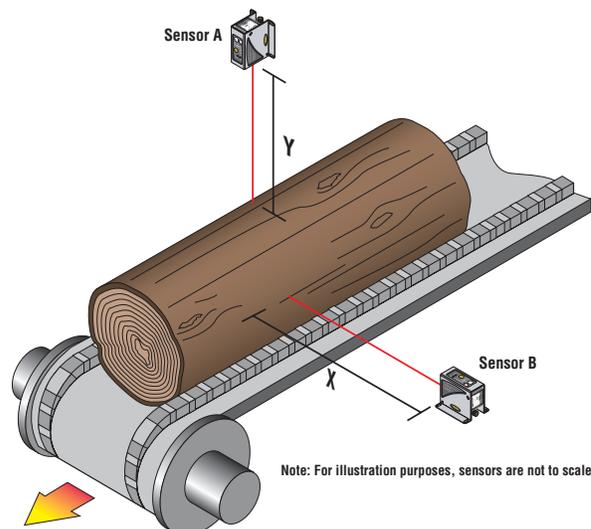


### LOG PROFILING

**Objective:** Detect and calculate the diameter of each log as it passes on a conveyor belt, in order to optimize the milling of the log.

**Sensors:** Two LT3 diffuse-mode sensors with analog/discrete outputs.

**Operation:** The LT3 sensors are placed above and to one side of the log conveyor. They are placed approximately 2 m (6.6') from the log's surface, safely out of the way to prevent damage to the sensors, but well within the sensors' operating range. Each log is positioned between raised tracks in the conveyor, in effect centering it in a "trough." Each sensor sends a signal to a PLC, representing the distance from the sensor to the surface of the log. The PLC then calculates the log's diameter, based on the known distances to each sensor.

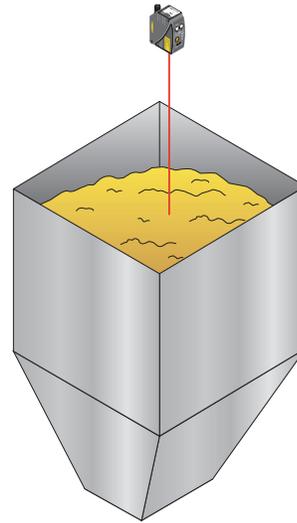




## L-GAGE® LT3 Laser Sensor Applications

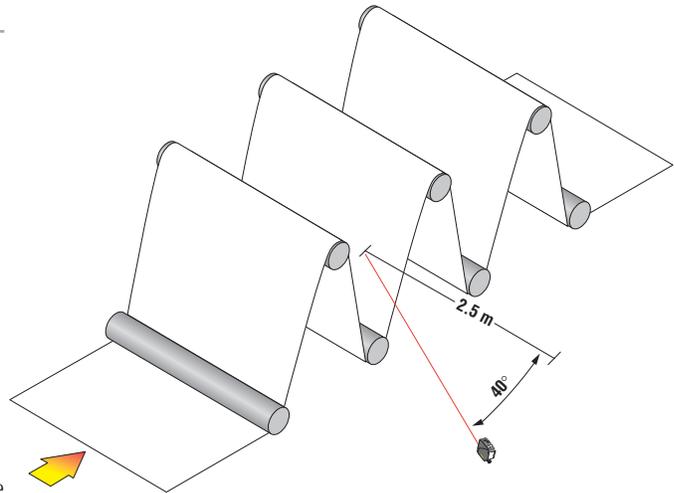
### HOPPER LEVEL MONITORING

- Objective:** To measure the level of dry material in a bin hopper.
- Sensor:** LT3 diffuse-mode sensor with analog/discrete outputs.
- Operation:** Ultrasonic sensors, which are often used to measure levels of liquid in a tank, can have difficulty measuring dry bulk materials, whose irregular textures do not present a perpendicular surface to the sound waves. The LT3 sensor, mounted above the hopper, easily measures the distance to the material, enabling a PLC to calculate the bin's fill level.



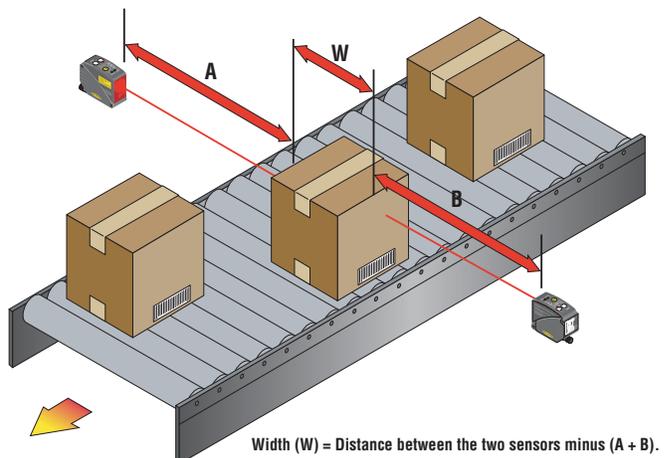
### WEB BREAK DETECTION

- Objective:** To detect a broken web in the dryer section of a paper-making machine.
- Sensor:** LT3 diffuse-mode sensor with two discrete outputs.
- Operation:** A web of newly made paper travels at speeds of more than 3,000' (914 m) per minute through a series of rotating cylinders. A break in the web must be found immediately, so sensors are used throughout the line. The ambient temperature in the drying portion of the process is too high for electronic sensors, however, the LT3, with its high speed and long operating range, is the perfect choice, as it can reliably sense a break at 2.5 m (8'), where the temperature is cooler. One discrete output may be programmed to send a stop signal to the machine, while the other signals an alarm.



### BOX WIDTH MEASUREMENT

- Objective:** To measure the widths of boxes on a conveyor.
- Sensor:** Two LT3 diffuse-mode sensors with analog/discrete outputs, mounted opposite each other.
- Operation:** As boxes of varying size travel down a conveyor, their positions are not fixed. The customer needs to know how wide each box is. Each LT3 sensor measures the distance between itself and the box (one measures distance A and the other, distance B). This information is transmitted to a PLC, which calculates the width (W) by subtracting distances A and B from the total distance between the sensors.



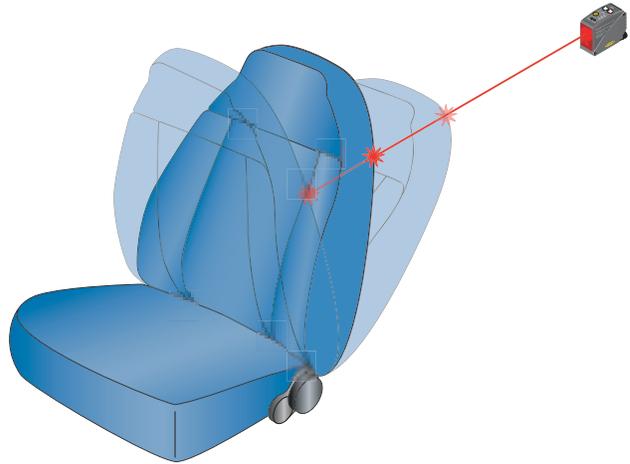
Width (W) = Distance between the two sensors minus (A + B).



## L-GAGE® LT3 Laser Sensor Applications

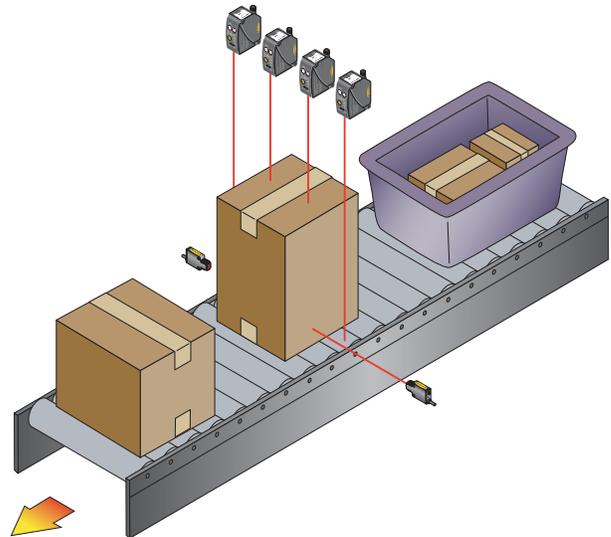
### AUTO SEAT RANGE-OF-MOTION

- Objective:** To accurately measure the range of motion of an auto seat back.
- Sensor:** LT3 diffuse-mode sensor with analog/discrete outputs.
- Operation:** The user needs to verify that each auto seat manufactured in a plant adjusts to the correct, predetermined positions. With the seat positioned in a fixture, the LT3 measures the distance to the back of the seat when it is placed into three angles of recline.



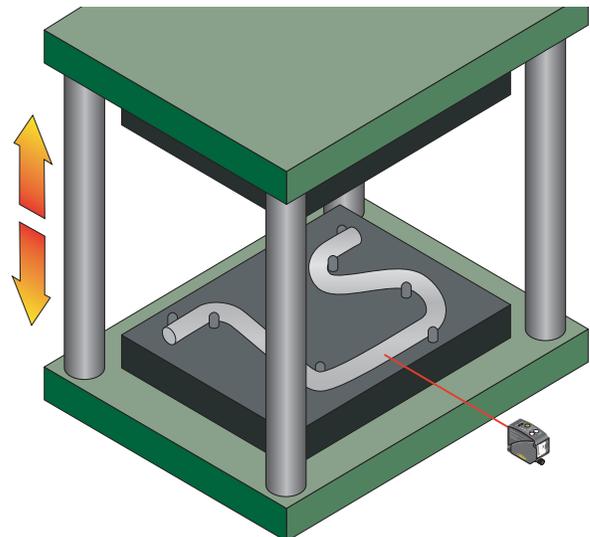
### PARCEL PROFILING

- Objective:** To accurately measure the height of parcels as they pass along a conveyor.
- Sensor:** LT3 diffuse-mode sensors with analog/discrete outputs  
MINI-BEAM®2 opposed-mode sensor pair.
- Operation:** To accurately measure the height of parcels on a conveyor, for a process down the line. Sometimes the parcel will be a single box; other times several boxes will be inside a tote, in which case only the first parcel in the tote need be measured. When triggered by the opposed sensor pair, an array of LT3 sensors measures the distance to the top of the parcel beneath them. The sensors are placed so that the sides of a tote carrying multiple parcels will not be detected by any LT3 sensor. The horizontal spacing of the LT3 sensors also could be used to provide a rough estimate of each parcel's width.



### HYDROFORMING PRESS DIE PROTECTION

- Objective:** To accurately verify the position of tubing, prior to die lowering.
- Sensor:** LT3 diffuse-mode sensor.
- Operation:** A robot places a preformed section of tubing into the lower die of a hydroforming press. The user needs to verify that the tubing is placed accurately each time, in order to prevent damage to the die. Prior to the upper die lowering, the LT3 sensor measures the distance to a critical portion of the tubing. The LT3's range allows it to be placed clear of the die; traditional sensors with their smaller ranges could not be located far enough away.

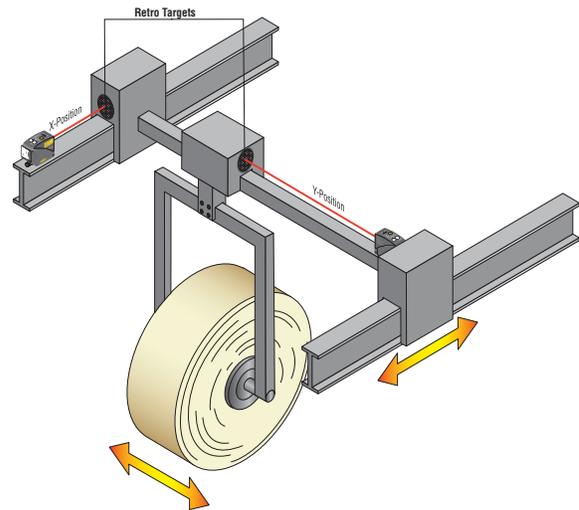




## L-GAGE® LT3 Laser Sensor Applications

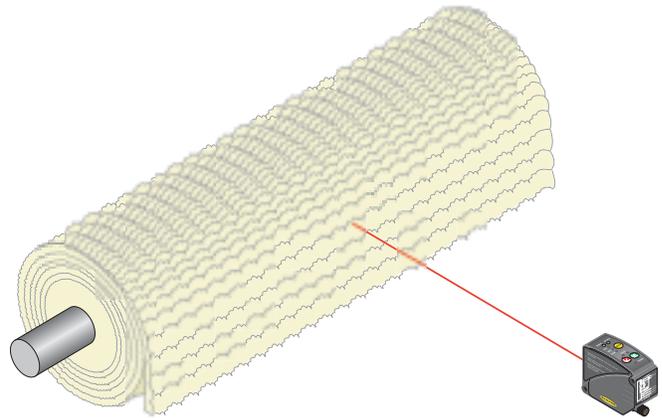
### TWO-AXIS CRANE POSITIONING

- Objective:** To verify position of an overhead bridge crane, in two axes.
- Sensor:** Two LT3 retroreflective-mode sensors, with retroreflective targets, and analog/discrete outputs.
- Operation:** The sensors are mounted facing their retroreflective targets, which are mounted on two mobile components of a bridge crane. One component moves back and forth, and the other from side to side. As the crane maneuvers the roll of sheet stock, the two sensors monitor the distance to their respective reflectors, enabling a PLC to continuously track the crane's exact position.



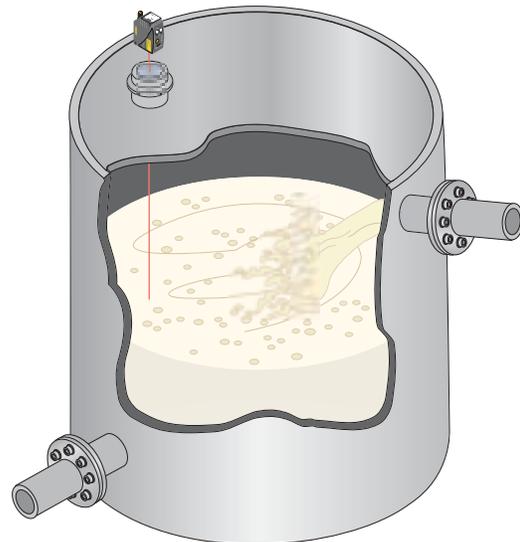
### ABSORPTIVE MATERIAL ROLL DIAMETER MEASUREMENT

- Objective:** To measure the thickness of a roll of absorptive material.
- Sensor:** LT3 diffuse-mode sensor with analog/discrete outputs.
- Operation:** A roll of absorptive material, such as disposable diaper liner, must be monitored. Because the rolls are large and bulky, the sensor must be mounted at a relatively long distance from the roll. As the roll shrinks, the sensor continuously measures the distance to its outer edge, allowing a PLC to calculate the roll's diameter and its length. Ultrasonic sensors will not function here because the material will absorb the sound waves. The LT3 sensor can detect this surface. The analog output indicates roll size; the discrete output can trigger an alarm when the roll is almost empty.



### SLURRY LEVEL CONTROL

- Objective:** To measure levels of liquid in a pharmaceutical process vessel.
- Sensor:** LT3 diffuse-mode sensor with analog/discrete outputs.
- Operation:** A non-intrusive measurement technique is required to measure liquid levels in a pharmaceutical vessel. The LT3 diffuse sensor is mounted on top of the vessel, and looks down through a clear sight glass. Because the liquid is an opaque slurry, it reflects sufficient light back to the sensor for measurement.



# L-GAGE® LT3 Laser Sensors Model Selection & Accessories

■ Discrete & 0-10V dc voltage analog outputs    ■ Discrete & 4-20 mA current analog outputs    □ Dual discrete outputs

Model Number	Part Number	Sensing Mode	Range	Resolution*	Cable	Analog Output	Discrete Output
LT3NUQ	65504	Diffuse Class 2 Laser	0.3 m to 5 m (1' to 16.4') with White Targets	1 mm (0.04")	8-pin Euro-style swivel QD	0 to 10V dc	NPN (Sinking)
LT3NU	65505				2 m (6.5') 8-wire **		
LT3PUQ	65507				8-pin Euro-style swivel QD		PNP (Sourcing)
LT3PU	65508				2 m (6.5') 8-wire **		
LT3NIQ	65510				8-pin Euro-style swivel QD	4 to 20 mA	NPN (Sinking)
LT3NI	65511				2 m (6.5') 8-wire **		
LT3PIQ	65513				8-pin Euro-style swivel QD	PNP (Sourcing)	
LT3PI	65514				2 m (6.5') 8-wire **		
LT3BDQ	65516				8-pin Euro-style swivel QD	None	NPN & PNP (Selectable)
LT3BD	65517				2 m (6.5') 8-wire **		
LT3NULVQ	67277	Retroreflective Class 1 Laser	0.3 m to 50 m (1' to 164')	3 mm (0.12")	8-pin Euro-style swivel QD	0 to 10V dc	NPN (Sinking)
LT3NULV	67276				2 m (6.5') 8-wire **		
LT3PULVQ	67274				8-pin Euro-style swivel QD		PNP (Sourcing)
LT3PULV	67273				2 m (6.5') 8-wire **		
LT3NILVQ	67283				8-pin Euro-style swivel QD	4 to 20 mA	NPN (Sinking)
LT3NILV	67282				2 m (6.5') 8-wire **		
LT3PILVQ	67280				8-pin Euro-style swivel QD	PNP (Sourcing)	
LT3PILV	67279				2 m (6.5') 8-wire **		
LT3PDLVQ	67381				8-pin Euro-style swivel QD	None	NPN & PNP (Selectable)
LT3PDLV	67380				2 m (6.5') 8-wire **		

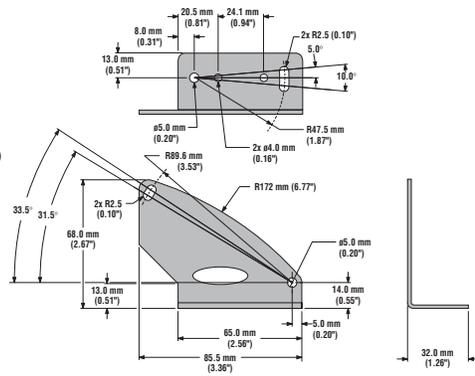
\* Best resolution for analog and discrete outputs determined with a white ceramic test surface at the specified distance, with the sensor response speed set for slow (100 milliseconds).

\*\* For 9 m (30") cable assembly, add W30 to model number.



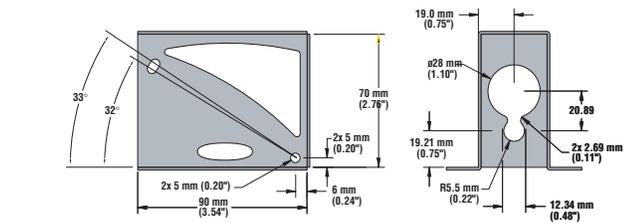
### L-GAGE LT3 Mounting Bracket Model SMBLT31.

Made of 300 series stainless steel, the right-angle LT3 mounting bracket is corrosion-resistant and allows up to 2° of vertical sensor adjustment, and up to 10° of horizontal sensor adjustment. The simple stainless steel design provides aesthetic appeal as well as functionality and durability. Part number 68505.



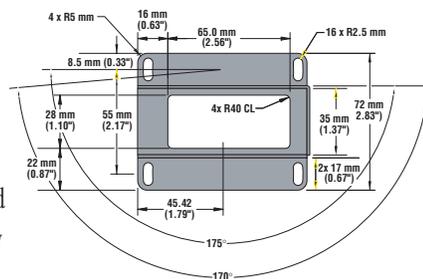
### L-GAGE LT3 Wraparound Mounting Bracket Model SMBLT32.

The protective wraparound bracket is made of 300 series stainless steel, and protects the sensor from impact in more challenging applications. It is corrosion-resistant, durable and allows up to 2° of vertical sensor adjustment. Part number 69236.



### Euro-style Quick Disconnect Cable Model MQDC-830.

Straight 8-pin cable, 9 m (30") length. Electrically shielded design with PUR jacket and polyurethane connector body with nickel plated brass coupling nut. Part number 57595.





# L-GAGE® LT3 Laser Sensor Specifications & Dimensions

## Sensing Characteristics:

**Sensing Beam:** 658 nm visible red; typical beam dia: 6 mm (typical laser lifetime 75,000 hours).

**Range:** *Diffuse model:* 0.3 to 5 m (1' to 16.4') with 90% white card; 0.3 to 3 m (1' to 9.8') with 18% gray card; 0.3 to 2 m (1' to 6.6') with 6% black card.  
*Retro model:* 0.3 to 50 m (1' to 164') range.

**Linearity:** *Diffuse model:* ±30 mm from 0.3 to 1.5 m; ±20 mm from 1.5 to 5 m. (±1.2" from 1' to 4.9'; ±0.8" from 4.9' to 16.4'), (Specified @24V dc, 22° C using a 90% reflectance white card).

*Retro model:* 50 mm from 0.3 to 2 m (2" from 1' to 6.5'), 20 mm from 2 to 50 m (0.8" from 6.5' to 164').

**Resolution/Repeatability:** *Diffuse model:* 1 mm (0.04") at 100 ms response speed with a white test surface. *Retro model:* 3 mm (0.12") at slow speed.

### Color Sensitivity (Diffuse models):

90% white to 18% gray: <10 mm;  
90% white to 6% black: <20 mm.

### Discrete Output Hysteresis:

*Diffuse model:* *Fast:* 10 mm (0.4")  
*Medium:* 5 mm (0.2")  
*Slow:* 3 mm (0.12")

*Retro model:* *Fast:* 30 mm (1.2")  
*Medium:* 20 mm (0.8")  
*Slow:* 10 mm (0.4")

**Temperature Drift:** <2 mm/°C.

**Remote Teach Input:** 18 kΩ minimum (65 kΩ at 5V dc).

**Remote TEACH:** *To teach:* Connect yellow wire to +5 to 24V dc.  
*To disable:* Connect yellow wire to 0 to +2V dc (or open connection).

**Adjustments:** *Response speed:* Push button toggles between 1, 10 and 100 ms (diffuse model)  
*Window limits (analog or discrete):* TEACH-mode programming of near and far window limits. Limits may also be taught remotely via TEACH input.  
*Analog output slope:* The first limit taught is assigned to minimum output current or voltage (4 mA or 0V dc).  
NPN/PNP selectable on dual discrete models.

**Laser Control:** Connect red wire to +5 to 24V dc to enable laser beam; connect to 0 to +1.8V dc (or open connection) to disable; 100 ms delay upon enable, when sensor is powered.

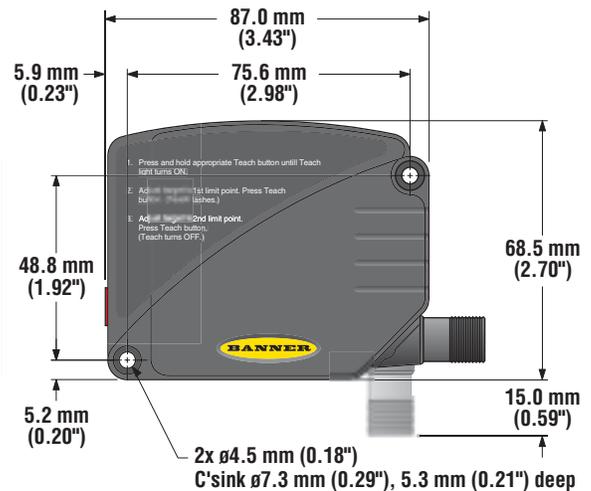
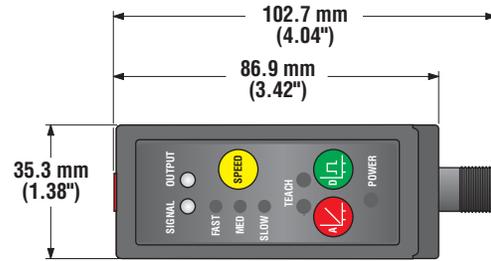
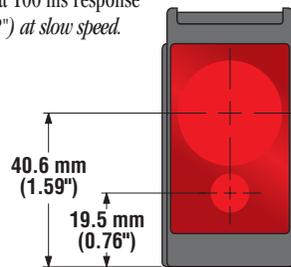
**Indicators:** *Green Power ON LED:* Indicates when power is ON, overloaded output and laser status.  
*Yellow Output LED:* Indicates when discrete load output is conducting.  
*Red Signal LED:* Indicates target is within sensing range and the condition of the received light signal.  
*Yellow Speed LED:* Indicates the response speed setting.  
*Red/Green TEACH LEDs:* Sensor is in programming mode (red – analog output; green – discrete output).

**Construction:** *Housing:* ABS/polycarbonate blend  
*Window:* Acrylic  
*Quick-disconnect:* ABS/polycarbonate blend

**Environmental Rating:** IP67, NEMA 6.

**Connections:** 2 m (6.5') or 9 m (30') shielded 7-conductor (with drain) PVC-jacketed attached cable or 8-pin Euro-style quick-disconnect.

**Operating Conditions:** *Temperature:* 0° to +50° C (+32° to +122° F).  
*Maximum Relative Humidity:* 90% at 50° C. (non-condensing).



**Vibration/mechanical Shock:** *Vibration:* 60 Hz, 30 minutes, 3 axes. *Shock:* 30G for 11 milliseconds, half sine wave, 3 axes.

**Application Note:** Allow 30-minute warm-up before programming or operating.

## Output Specifications:

**Output Configurations:** Discrete (switched) output: SPST solid-state switch (choose NPN or PNP models; dual discrete models: selectable NPN or PNP).

Analog output: 0 to 10V dc or 4 to 20 mA.

**Output Ratings:** Discrete (switched) output: 100 mA maximum.

Off-state leakage current: <5µA.

Output saturation NPN: <200 mV @ 10 mA and <600 mV @ 100 mA.

Output saturation PNP: <1.2V @ 10 mA; <1.6V @ 100 mA.

Analog voltage output: 2.5 kΩ minimum load impedance.

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

**Output Protection:** Protected against short circuit conditions.

**Output Response Time:** Discrete output:

*Fast:* 1 ms ON and OFF

*Medium:* 10 ms ON and OFF

*Slow:* 100 ms ON and OFF

Analog output (-3 dB):

*Fast:* 1000 Hz (1 ms average/1 ms update rate)

*Medium:* 100 Hz (10 ms average/2 ms update rate)

*Slow:* 10 Hz (100 ms average/4 ms update rate)

# L-GAGE® LT3 Laser Sensor Specifications & Beam Information

## Supply Specifications:

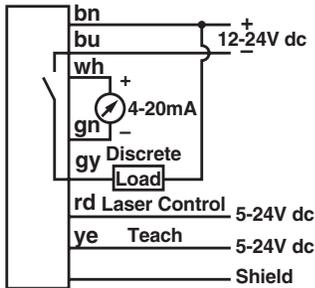
**Supply Voltage and Current:** 12 to 24V dc (10% maximum ripple); 108 mA max. @24V dc or (2600V dc) mA.

**Sensing Supply Protection Circuitry:** Protected against reverse polarity, over voltage, and transient voltages.

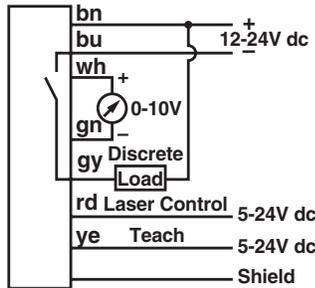
**Delay at Power-up:** 1 second; outputs do not conduct during this time.

## Hookup Diagrams

### NPN Analog

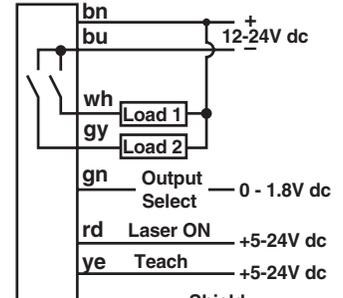


Current



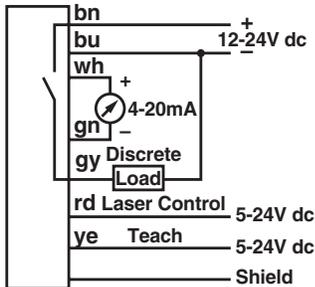
Voltage

### NPN Dual Discrete

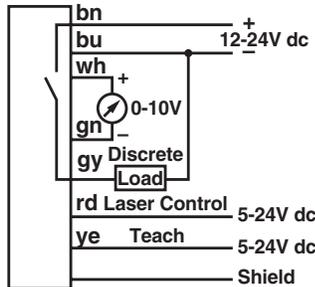


Hookups for QD models are identical.

### PNP Analog

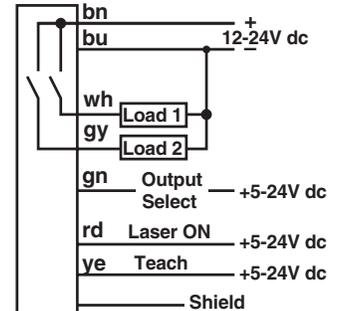


Current



Voltage

### PNP Dual Discrete



Hookups for QD models are identical.

## Laser Beam Information

**Class 2 Laser:** Diffuse-mode models

**Class 1 Laser:** Retroreflective-mode models



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