



BANNER[®]

more sensors, more solutions

L-GAGE[™]

Laser Gauging Sensors

L-GAGE™: A new paradigm for precision laser measurement.

Unique,* self-contained design replaces large, cumbersome systems.

Laser gauging sensors are typically large, two-piece systems, and are difficult to use. The new Banner L-GAGE has changed all that with a completely self-contained, 12 to 30V dc patent-pending design measuring only 55 mm X 82 mm X 20 mm (2.2" X 3.2" X 0.8"). By eliminating the need for a separate controller, the one-piece L-GAGE is easier to wire, decreases setup time and conserves valuable production space, with the added bonus of superior performance.

**Patent pending*

Ultra-precise & accurate, with both analog & discrete outputs.

Advanced digital signal processing algorithms make the L-GAGE Class 2 modulated visible laser gauging sensor a powerhouse of performance for a wide range of measurement applications. It features an outstanding maximum resolution of 3 μm (0.0001"). It's ultra-narrow effective beam resolves precision distance, height or thickness measurement and gauging applications, including robot arm calibration, wafer profiling, diameter or thickness measurement, and assembly dimension inspection, to name only a few.

A price point as sharp as its laser emitter.

Now you can upgrade to laser technology for the same cost as a contacting sensor. L-GAGE sensors are the first in their category to break the \$1,000 price barrier, providing an economical and highly accurate solution at a much lower cost. Previously cost-prohibitive applications can now be solved with ease. And because L-GAGE sensors do not contact the parts they measure, they can be used with moving processes, hot parts and sticky parts. They also include measuring features that are unavailable on contacting probes, giving the L-GAGE sensors a distinct advantage in performance as well as price.

Infinitely more flexible.

L-GAGE sensors are vastly more flexible and easier to program than currently-available gauging sensors. Why buy an inflexible fixed-range laser sensor when the more-advanced L-GAGE lets you pick the exact range you need with the push of a button? And you get both discrete (switched) and analog outputs in the same unit, each independently programmable. It's a better solution for all your applications. For additional flexibility, analog units are available with either 4 to 20 mA or 0 to 10V outputs.



L-GAGE™: The world's first teachable laser sensor.

Define your own custom sensing window by simply pushing a button.

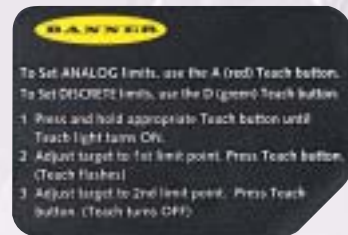
Unlike older, inflexible, fixed-range technology, Banner's unique TEACH-mode programming allows you to set your own custom-sized sensing windows, and place them anywhere within either a 45 mm to 60 mm (1.8" to 2.4") or 75 mm to 125 mm (2.9" to 4.9") range using a single push button.

One L-GAGE sensor can be easily programmed to provide an analog output, discrete output, or both simultaneously with independently controlled sensing window limits.



Automatic gain control.

L-GAGE sensors feature Automatic Gain Control (AGC) to automatically compensate for varying colors, helping to minimize linearity errors and false triggering associated with conventional laser sensors.



Easy as 1, 2, 3!

Simple programming instructions (three short sentences) are printed on the side of the L-GAGE for permanent, easy access.



Remote programming.

For maximum convenience and easier access for programming hard-to-reach sensors, TEACH-mode programming can also be accomplished from a remote location using an external switch, computer or controller. The integral key pad may be locked remotely, providing added security by eliminating possible tampering with sensor adjustments.



L-GAGE™: Advanced features help you solve more applications.



Exclusive scalable analog output.

Unlike conventional gauging sensors, and available only from Banner, L-GAGE sensors allow you to automatically scale the analog output over your desired sensing window. This unique feature speeds setup and allows for maximum resolution in electrically-noisy environments. Unique Auto-Zero feature allows you to easily set a sensing distance set point centered within a 10 mm wide window.

Programmable response times.

Output response is programmable to three speeds, one, 10, and 100 milliseconds, by simply pushing a button. You instantly get the response time that works with your machine cycle speeds.



Ambient light immunity.

With its modulated laser beam and narrow optical band-pass filter, the L-GAGE is highly immune to ambient light, including high-energy factory lighting.

Protected circuitry.

Integral circuitry protects L-GAGE sensors from reverse polarity, over voltage, and transient voltage.



Durable construction.

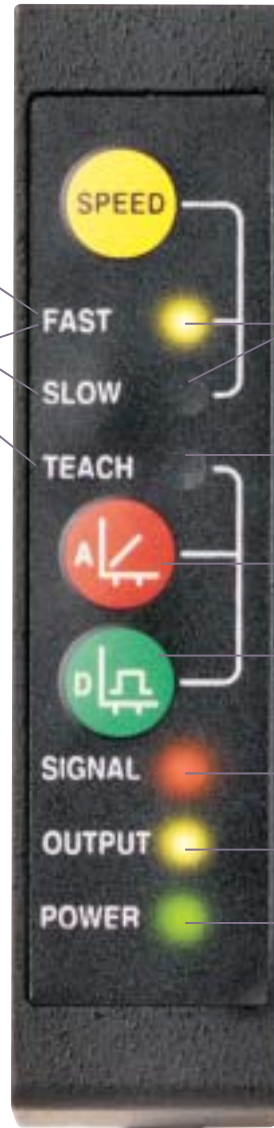
Rugged L-GAGE sensors have a die-cast zinc alloy housing, with an aluminum top cover and an acrylic lens cover. They are rated IP67 and NEMA 6, and have an operating temperature range of -10° to +50°C (+14° to +122°F).

Pre-wired or quick-disconnect, 10 to 30V dc.

L-GAGE sensors are available with a 2 m (6.5') or 9 m (30') attached, 8-conductor PVC potted-in cable, or an 8-pin Euro-style quick disconnect pigtail connector that allows easy sensor installation and removal. Keyed connectors prevent wiring errors.

Advanced diagnostics.

L-GAGE sensors keep you constantly informed of operating status throughout programming and operation. Sensors also include an alarm output for signal saturation; discrete output can be programmed to detect a missing target.



Fast LED:
1.0 ms response

Both LEDs:
10 ms response

Slow LED:
100 ms response

Yellow fast/slow LEDs indicate response time.

Tri-color (red, green, yellow) TEACH LED indicates sensor is ready for programming each limit (analog, discrete, or both analog and discrete).

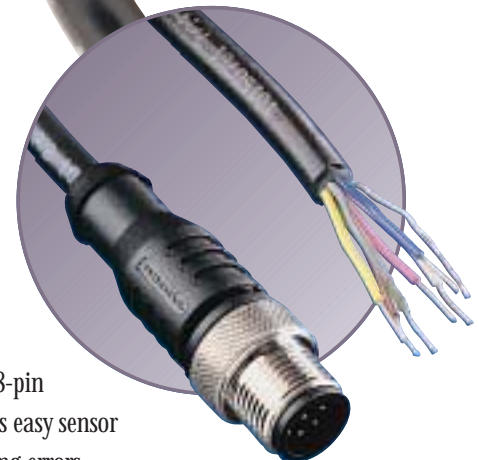
Analog Teach button.

Discrete Teach button.

Red LED indicates target is in the sensing window and the condition of the received light signal.

Yellow LED indicates when the discrete load output is conducting.

Green LED indicates Power ON and flashes to indicate Output Overloaded and disabled laser.





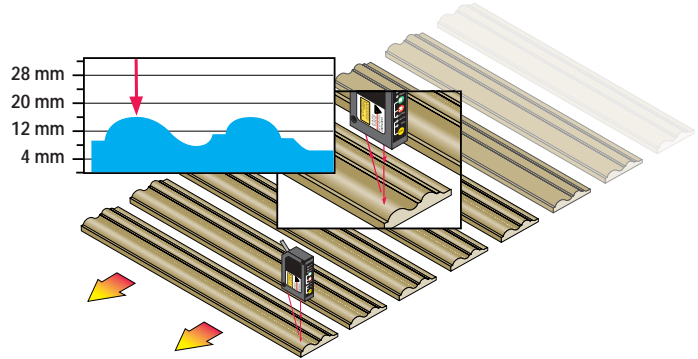
L-GAGE™ Laser Sensor Applications

WOOD PROFILING

Objective: Profile wood moldings; inspect milled dimensions.

Sensor: L-GAGE model **LG10A65NU**

Operation: The L-GAGE, with a 100 mm standoff distance and a 50 mm measuring window, can accurately profile a wide variety of wooden moldings in milling applications. Not only is the L-GAGE fast and accurate, it is also very tolerant of changing wood colors. For example, changing from dark walnut to light ash requires no change in sensor configuration.

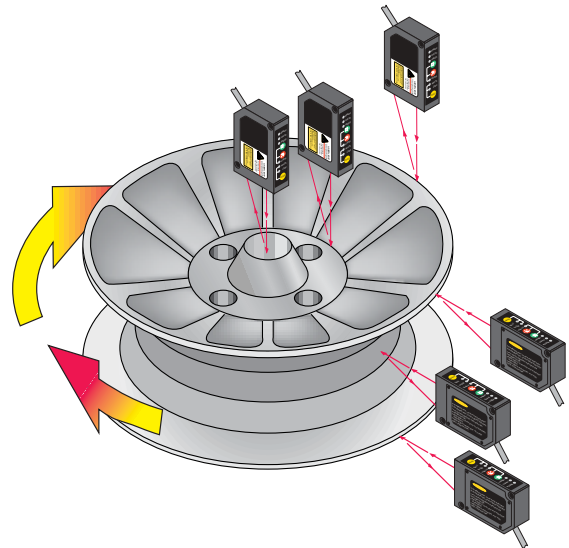


RUN-OUT INSPECTION OF WHEEL CASTING

Objective: Prior to machining, inspect a wheel casting to ensure that six critical dimensions are within tolerance.

Sensor: L-GAGE model **LG5A65PU**

Operation: Wheel castings slide into a rotating fixture beneath six stationary L-GAGE sensors. Each L-GAGE is positioned so that a nominal casting is at the center of the sensor's measuring window. The 0 to 10V dc outputs of all six sensors are fed into a PLC, which records maximum runout. The LG5A, with its wide beam diameter, was selected for best output stability on a rough casting surface. The L-GAGE non-contact sensor eliminates frequent sensor replacement and recalibration.

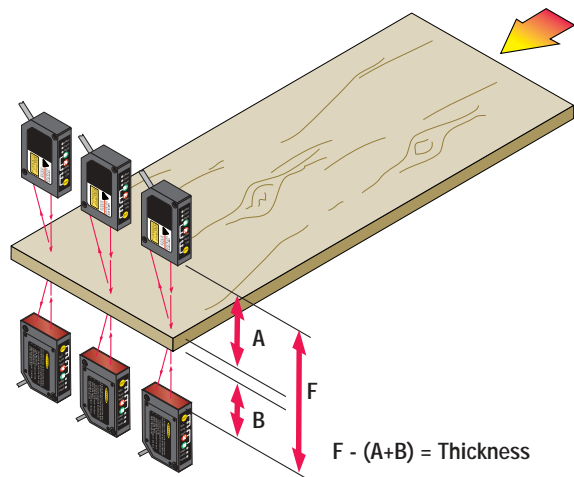


THICKNESS MEASUREMENT OF PLYWOOD

Objective: Measure thickness at three points across the width of a sheet of plywood

Sensor: L-GAGE model **LG10A65NU**

Operation: Three pairs of L-GAGE sensors are set up across a sheet of laminate. Thickness at each location is determined by subtracting the distance from each sensor to the plywood from the distance between the pair of sensors: $t = F - (A + B)$, where A is the top distance, B is the bottom distance, and F is the fixed distance between the sensors in each pair.



L-GAGE™ Laser Sensors Model Selection & Accessories

■ 4-20 mA current analog output

■ 0-10V dc voltage analog output

Model Number	Part Number	Range	Focal Point	Resolution*	Cables	Analog Output	Discrete Output
LG5A65NI	54086	45 - 60 mm (1.8" - 2.4")	70 mm (2.8")	<3 μm (0.0001") @ 50 mm	2m (6.5') 8-wire**	4-20ma Sourcing	NPN (sinking)
LG5A65NIQ	54087				6" (15.2 cm) 8-pin Euro QD		
LG5A65PI	54089				2m (6.5') 8-wire**		0-10V dc Sourcing
LG5A65PIQ	54090				6" (15.2 cm) 8-pin Euro QD		
LG5A65NU	57571				2m (6.5') 8-wire**	PNP (sourcing)	
LG5A65NUQ	57572				6" (15.2 cm) 8-pin Euro QD		53 mm (2.1") For small object detection
LG5A65PU	57565		2m (6.5') 8-wire**		4-20ma Sourcing		
LG5A65PUQ	57566		6" (15.2 cm) 8-pin Euro QD			PNP (sourcing)	
LG5B65NI	55964		2m (6.5') 8-wire**		0-10V dc Sourcing		
LG5B65NIQ	55968		6" (15.2 cm) 8-pin Euro QD			NPN (sinking)	
LG5B65PI	55966		2m (6.5') 8-wire**				
LG5B65PIQ	55969		6" (15.2 cm) 8-pin Euro QD			75 - 125 mm (3.0" - 4.9")	
LG5B65NU	57574	2m (6.5') 8-wire**	NPN (sinking)				
LG5B65NUQ	57575	6" (15.2 cm) 8-pin Euro QD		PNP (sourcing)			
LG5B65PU	57568	2m (6.5') 8-wire**	4-20ma Sourcing				
LG5B65PUQ	57569	6" (15.2 cm) 8-pin Euro QD		PNP (sourcing)			
LG10A65NI	54092	2m (6.5') 8-wire**			NPN (sinking)		
LG10A65NIQ	54093	6" (15.2 cm) 8-pin Euro QD		PNP (sourcing)			
LG10A65PI	54095	2m (6.5') 8-wire**	0-10V dc Sourcing				
LG10A65PIQ	54096	6" (15.2 cm) 8-pin Euro QD		NPN (sinking)			
LG10A65NU	57577	2m (6.5') 8-wire**			PNP (sourcing)		
LG10A65NUQ	57578	6" (15.2 cm) 8-pin Euro QD		0-10V dc Sourcing			
LG10A65PU	57580	2m (6.5') 8-wire**	NPN (sinking)				
LG10A65PUQ	57581	6" (15.2 cm) 8-pin Euro QD		PNP (sourcing)			

* 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 w/30 to model number.



L-GAGE Mounting Bracket Model SMBLG (Part Number 55815)

Type 304 stainless steel mounting bracket is corrosion resistant and provides up to 42° of vertical adjustment and up to 40° of horizontal adjustment. This attractively designed unit enhances the appearance of your equipment and saves you time and money through reduced installation time and lower total installed cost. **Custom brackets** can be designed for your unique applications.



L-GAGE Mounting Bracket Model SMBLGA (Part Number 55906)

Similar to Model SMBLG above but also provides spring-loaded precision adjustment screws enabling the installer to make extremely accurate adjustments for small targets or long range applications. Type 304 stainless steel. Request the Banner Sensor Catalog (P/N 99000) or CD ROM (P/N 99100) for other available models. **Custom brackets** can be designed for your unique applications.



Euro-style Quick Disconnect Cable Model MQDC-830 (Part Number 57595)

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



L-GAGE™ Laser Sensor Specifications & Dimensions

Supply Specifications:

Supply Voltage: 12 to 30V dc, (10% maximum ripple); 50mA max at 24Vdc (exclusive of load).

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

Delay at Power-up: 1.25 second.

Sensing Characteristics:

Sensing Beam: 670 nm visible red IEC and CDRH Class 2 laser; 0.20 mW maximum radiant output power.

Range: LG5: 45.0 to 60.0 mm (1.77" to 2.36"); LG10: 75.0 to 125.0 mm (2.95" to 4.92").

Minimum Window Size (Analog or Discrete): LG5: 1.5 mm (0.06"); LG10: 5 mm (0.2").

Analog Resolution and Repeatability of Discrete Trip Point:

LG5 System response speed set at *fast*: <40 μm (0.0016") @ 50 mm (2").
System response speed set at *medium*: <12 μm (0.0005") @ 50 mm (2").
System response speed set at *slow*: <3 μm (0.0001") @ 50 mm (2").

LG10 System response speed set at *fast*: <150 μm (0.006") @ 100 mm (2").
System response speed set at *medium*: <50 μm (0.0016") @ 100 mm (2").
System response speed set at *slow*: <10 μm (0.0016") @ 100 mm (2").

Analog Linearity:

LG5 $\pm 60 \mu\text{m}$ (± 0.002 ") over 45 to 60 mm (1.77" to 2.36") sensing window.
 $\pm 10 \mu\text{m}$ (± 0.0004 ") over 49 to 51 mm (1.93" to 2.00") sensing window.

LG10 $\pm 200 \mu\text{m}$ (± 0.008 ") over 75 to 125 mm (2.95" to 4.92") sensing window.
 $\pm 20 \mu\text{m}$ (± 0.0008 ") over 95 to 100 mm (3.74" to 3.93") sensing window.

Hysteresis (Discrete Output): LG5: < 0.2 mm (0.008"); LG10 <1 mm (0.04").

Color Sensitivity: LG5: <75 μm (0.003") (typical) for white or dark gray ceramic target;
LG10: < 100 μm (0.01") (typical) for white or dark gray ceramic target.

Temperature Drift: LG5: $\pm 7 \mu\text{m}/^\circ\text{C}$; LG10: $\pm 25 \mu\text{m}/^\circ\text{C}$.

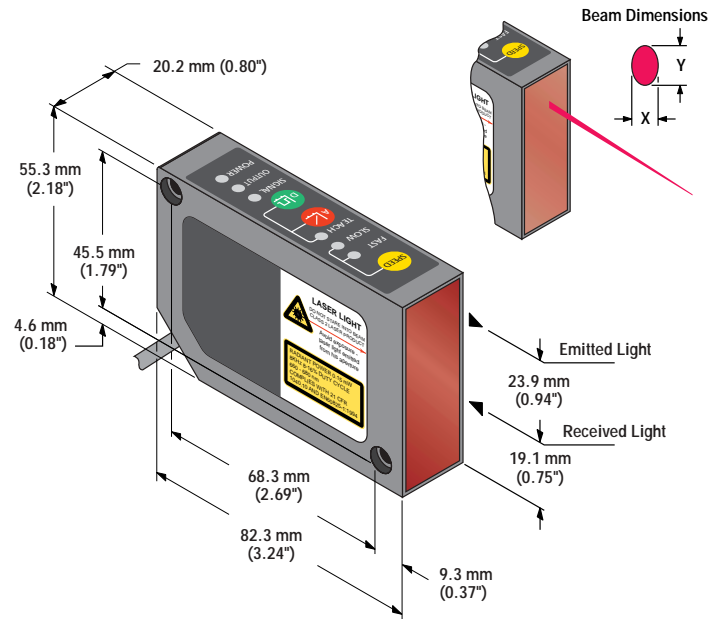
Output Specifications:

Output Configurations: Discrete (switched) output: SPST solid-state switch (choose NPN or PNP models).
Analog output: Current models: 4 to 20 milliamp current sourcing; Voltage models: 0 to 10V dc current sourcing.
Alarm output: SPST Solid-state switch (NPN or PNP depending on discrete output model).

Output Ratings: Discrete (switched): 100 mA maximum.
Analog output: Current models: 1K Ω max @ 24V dc;
Voltage models: 2.5K Ω minimum load impedance.
Alarm output: 100 mA maximum.

Output Protection: Discrete outputs are protected against continuous overload and short circuit.

Output Response Time: Discrete output: system response speed set at *fast*: 2.0 milliseconds ON and OFF; system response speed set at *medium*: 10 milliseconds ON and OFF; system response speed set at *slow*: 100 milliseconds ON and OFF
Analog output (-3 dB): *fast*: 450 Hz (1 millisecond); *medium*: 45 Hz (10 millisecond); *slow*: 4.5 Hz (100 millisecond).



L-GAGE Beam Dimensions (typical)

Focal Point*	Distances	Beam Width (X)	Beam Height (Y)
53 mm (2.1")	45 mm	0.3 mm	0.5 mm
	53 mm	0.1 mm	0.1 mm
	60 mm	0.3 mm	0.5 mm
70 mm (2.8")	45 mm	0.6 mm	0.9 mm
	53 mm	0.4 mm	0.6 mm
	60 mm	0.3 mm	0.4 mm
180 mm (7.1")	75 mm	1.1 mm	1.5 mm
	100 mm	0.8 mm	1.1 mm
	125 mm	0.6 mm	0.8 mm

* The Focal Point is the distance measured from the lens (front of sensor) at which the diameter of the laser image is smallest.

Banner: Industry's number one supplier of sensors & machine safety products.

When you buy your sensors and machine safety products from Banner, you gain the confidence of dealing with the industry's largest, most knowledgeable and experienced photoelectric company. We have the broadest line of products and the most advanced manufacturing capabilities in the industry. We can handle any size order, large or small, utilizing the most advanced manufacturing capabilities. We can deliver any of more than 15,000 different products in just three days—most can ship within hours!

Just as important, we have the largest photoelectric sales and support network in the industry, backed by the world's finest application engineers. With our global sales support network, we're close by wherever you're located, and we're ready to help you with your applications, plus give you excellent service support. When you add it up, you'll find the best value in Banner products.

Visit Banner On-Line at www.baneng.com

- Complete product information for:
 - Photoelectric sensors
 - Measurement and inspection sensors
 - Machine safety products

- Up-to-date "What's New" page.
- Complete descriptions for each product, with links to product data sheets and dimension drawings.
- Product catalogs, specifier's guides, and product brochures available for immediate download or email request.
- Documents available in multiple languages.



For more information or applications assistance:

**Call 1.888.3.SENSOR
(1.888.373.6767)**



The Banner Photoelectric Sensors Catalog & CD ROM.

The industry's most complete catalog; more than 700 pages of detailed product and technical information on more than 12,000 photoelectric sensors. Simple selection charts make specifying the correct sensor easier than ever. Call, write, or email for your copy today, P/N 99000; CD ROM, P/N 99100.



The Banner Machine Safety Products Catalog & CD ROM.

A complete catalog of Machine Safety Products including Banner's extensive line of safety light screen controllers, emitters and receivers. Also included are Banner's two-hand anti-tiedown controls and full line of safety interlock switches and E-stop safety modules. Call, write, or email for your copy today, P/N 99500; CD ROM, P/N 99100.



Worldwide Representation.

- | | | | | |
|------------------|-------------|--------------|----------------|------------------|
| • Australia | • Denmark | • Indonesia | • Netherlands | • Slovakia |
| • Argentina | • Egypt | • Ireland | • New Zealand | • Spain |
| • Austria | • Estonia | • Israel | • Norway | • Sweden |
| • Belgium | • Finland | • Italy | • Pakistan | • Switzerland |
| • Brazil | • France | • Japan | • Peru | • Taiwan |
| • Canada | • Germany | • Korea | • Philippines | • Thailand |
| • Chile | • Greece | • Latvia | • Poland | • Turkey |
| • China | • Hong Kong | • Lithuania | • Portugal | • United Kingdom |
| • Colombia | • Hungary | • Luxembourg | • South Africa | • Uruguay |
| • Costa Rica | • Iceland | • Malaysia | • Russia/CIS | • Venezuela |
| • Czech Republic | • India | • Mexico | • Singapore | |

Banner Engineering Corporation, P.O. Box 9414, Minneapolis, MN 55440 U.S.A.
Phone 612.544.3164 Fax 612.544.3213 www.baneng.com Email: sensors@baneng.com