SA1L: One-Touch Photoelectric Positioning Sensors

Key features of the SA1L include:

- Dual-purpose photoelectric sensors detect presence and position
- Setting the position distance is as easy as pushing a button
- Visible beam makes precise alignment simple
- Remote set using external signal (available on one-channel units)
- Memorizes two different positions (available on two-channel units)
- Precise leading edge detection of different-colored objects (minimizes the effects of the differences in reected light intensities)
- Detects leading edge *and* distance position of similar objects
- Wide sensing range: 0.787" to 7.87" (20mm to 200mm) for infrared units
- Install alignment marks easily so that direct reection is minimized
- Featuring light on units (detect presence of object) with NPN outputs

General Specifications

Power Voltage	12 to 24V DC
Operating Voltage	10 to 30V DC (ripple 10% maximum)
Current Draw	40mA (maximum)
Dielectric Strength	Between live and dead parts: 1000V AC, 1 minute
Insulation Resistance	Between live and dead parts: 20MΩ (minimum), with 500V DC megger
Operating Temperature	–20 to +55C (performance will be adversely affected if the sensor becomes coated with ice)
Operating Humidity	35 to 85% RH (avoid condensation)
Storage Temperature	–30 to +70C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 20 cycles in each of 3 axes crossed (one cycle = 5 minutes)
Shock Resistance	Damage limits: 500m/sec^2 (approximately 50G), 3 shocks in each of 6 axes
Extraneous Light Immunity	Sunlight: 10,000 lux; Incandescent light: 3,000 lux (maximum) — dened as incident or unwanted light received by a sensor , unrelated to the presence or absence of intended object
Material	Housing: PBT; Lens cover: Polyarylate
Degree of Protection	IP67 — IEC Pub 529; Sensors rated IP67 are dust-tight, water-tight, and are tol-erant of being submerged and splashed with water for short periods
Cable	Cable type: 4-core cabtyre cable 0.18mm^2, 6'–6-3/4" (2m) long
Weight	Approximately 70g
Dimensions	1.48"H x 0.55"W x 1.50"D (37.5mm H x 14mm W x 38mm D)

Function Specifications

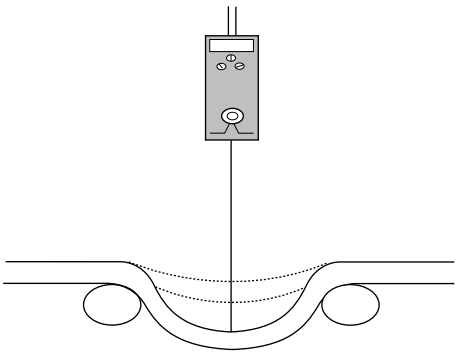
		One-Channel (SA1L-LN1, -LN1H)	Two-Channel (SA1L-LN1A, -LN1AH)
Output		NPN transistor open collector, 30V DC, 100mA (maximum) Residual: 1.2V (maximum) with short circuit protection	
Operation Modes		SET: Memorize position distance RUN N: Operate in normal mode RUN T: Operate in tilt mode	SET CH1: Memorize position distance for channel 1 SET CH2: Memorize position distance for channel 2 RUN: Operate in normal or tilt mode
External Signal		Switch to set position distance	Switch to select channel 1 or 2
Stable LED (green)	**Run Mode**	On: Stable sensing conditions	On: Stable sensing conditions
	Set Mode	On: Conrms position setting (2 seconds) Blinking: Indicates unsuccessful set-ting	On: Conrms setting of channel 1 (4 seconds) or channel 2 (2 seconds) Blinking: Indicates unsuccessful setting
	Normal ↔ Tilt Mode	No indication	Off: When changing to normal mode Blinking: When changing to tilt mode
Channel LED (amber)		Not applicable	On: When operating in channel 1 Off: When operating in channel 2
Out LED		On: When output is on (red LED)	On: When output is on (red LED)
Response Time		3.5ms (maximum)	3.5ms (maximum)
Hysteresis		10% (maximum) — the difference between operating point and release point	

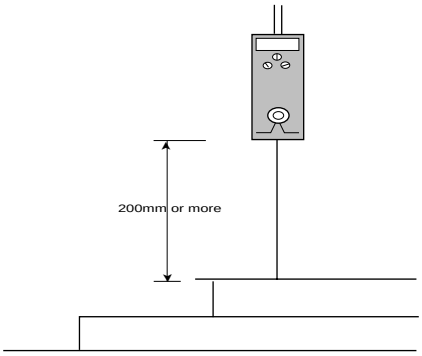
Part Numbers: SA1L Sensors

Part Number	Channels	Light Source	Setting Range	Detect Range	Output
SA1L-LN1 **SA1L-LN1A**	1 2	Infrared LED	1.97" to 7.87" (50mm to 200mm)	0.79" (20mm) minimum	NPN transistor light on (detects the presence of an object)
SA1L-LN1H **SA1L-LN1AH**	1 2	Red LED	1.97" to 3.94" (50mm to 100mm)		

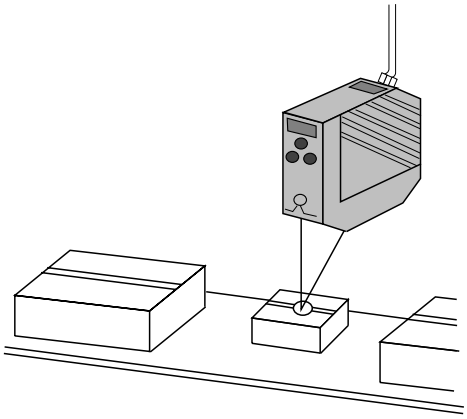
Special order units with dark on (detect absence of object) by replacing "–L ■1" in the P/N with "–L ■2".
Special order PNP outputs by replacing "–LN■" in the P/N with "–LP■". (Allow extra time for delivery of special orders.)

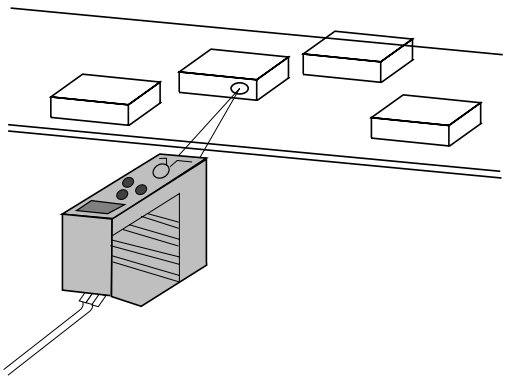
Applications



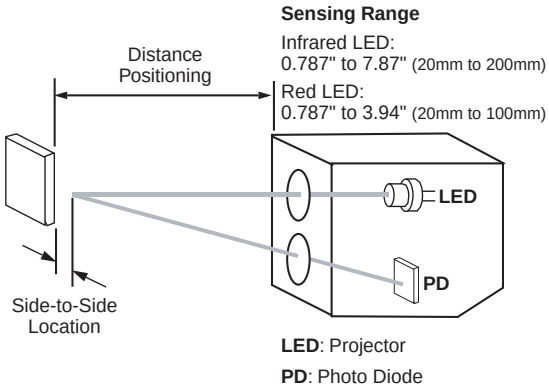


Detecting the presence of an object
in front of an immediate background





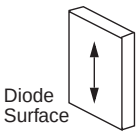
Operation Principle



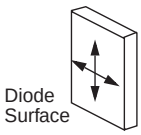
The photoelectric position sensor projects a beam from an LED, through the projection lens, to the object. Units are available with infrared or red LED. Reected light from the object is collected by a photo diode.

Normal mode: Touch the preset button with the sensor aimed at an object in the desired position. Optical triangulation is used to measure the distance to the object. The detected position is compared to the one-touch value stored in memory. Output corresponds to a match.

Tilt mode: Senses side-to-side location, in addition to the functions explained in the normal mode. The tilt mode is unique because it is possible to detect the leading edge of objects which vary in color (light objects together with dark objects). Tilt mode is also ideal for detecting the leading edge *and* distance position of similarly colored objects.



Normal Mode:
optical triangulation is used to detect distance positioning



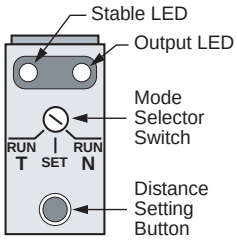
Tilt Mode:
senses side-to-side location, as well as distance positioning

Operation: One-Channel (SA1L-LN1, -LN1H)

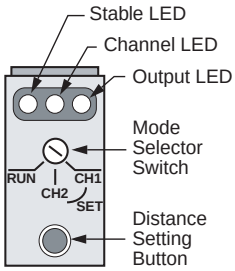
See page H-112 for general sensor instructions. Below are considerations specic to SA1L photo sensors.

Do not operate the sensor for approximately 60ms after turning the power on to prevent a transient state.

One-Channel



Two-Channel



Mode selector switch: Select SET to memorize position distance, RUN N to operate in normal mode, or RUN T to operate in tilt mode. Tilt mode is recommended for the precise detection of an object's leading edge and for sensing objects with varying intensities of reected light (for example, dark objects together with light objects).

Distance setting button: When using the mode selector switch in the SET position to memorize position distance, place the object to be detected at the desired position and press the distance setting button once. The green stable LED will turn on for two seconds to conrm the setting. (The green stable LED ashes for two seconds to indicate an unsuccessful setting.)

Remote distance setting: When using an external signal to set distance, install a switch using the SET terminal as shown in the wiring diagram on the following page. Select the desired mode of operation or select a set mode using the mode selector switch (RUN N, RUN T, or SET). Then place object to be detected at the desired position. Turn the external switch on (duration ≥ 100ms) to set the position distance. Turn the external switch off to resume operation in the selected mode.

If the SET mode is selected, the green stable LED will turn on for two seconds to conrm the setting . Select the desired mode of operation using the mode selector switch (RUN N or RUN T) to resume operation.

Operation: Two-Channel (SA1L-LN1A, -LN1AH)

Mode selector switch: Select SET CH1 to memorize position distance for channel one, SET CH2 to memorize position distance for channel two, or RUN to operate the sensor in one of two operating modes. The mode of operation (normal or tilt) is selectable as described below.

Distance setting button: When using the mode selector switch in the SET CH1 or SET CH2 position to memorize position distance, place the object to be detected at the desired position and press distance setting button once. The green stable LED will turn on for 4 seconds to conrm the setting for channel 1 and for 2 seconds to conrm the setting for channel 2. (The green stable LED ashes for the corresponding duration to indicate an unsuccessful setting.)

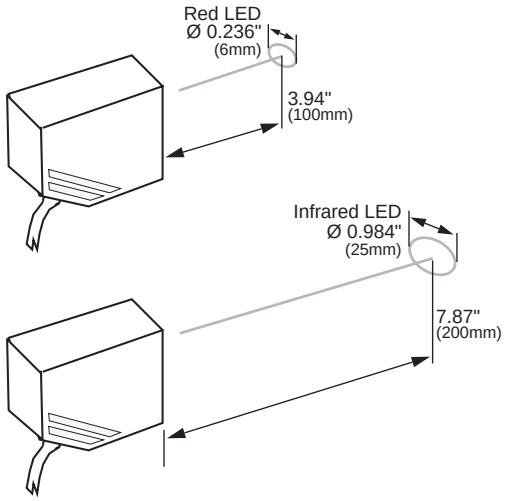
Selecting normal mode: Set the mode selector switch to RUN, and use the distance setting button as a two-way toggle. Press the button ve times in quick succession (within seven seconds) to toggle from one mode (tilt) to the other (normal). During the remaining time (seven seconds minus the time spent pressing the button ve times), the green stable LED will conrm the mode of operation as follows.

When selecting the normal mode, the green stable LED turns off immediately after pressing the button ve times; this conrms that the normal mode has been selected. (In both modes, the green stable LED turns back on after the total delay — seven seconds — has elapsed, and the LED remains on during operation.)

Selecting tilt mode: Set the mode selector switch to RUN, and use the distance setting button as a two-way toggle. Press the button ve times in quick succession (within seven seconds) to toggle from one mode (normal) to the other (tilt). During the remaining time (seven seconds minus the time spent pressing the button ve times), the green stable LED will conrm the mode of operation as follows.

When selecting the tilt mode, the green stable LED starts ashing immediately after pressing the button ve times; this conrms that the tilt mode has been selected. (In both modes, the green stable LED turns back on after the total delay — seven seconds — has elapsed, and the LED remains on during operation.)

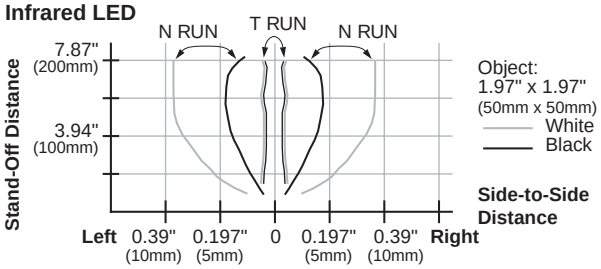
Projected Beam Characteristics



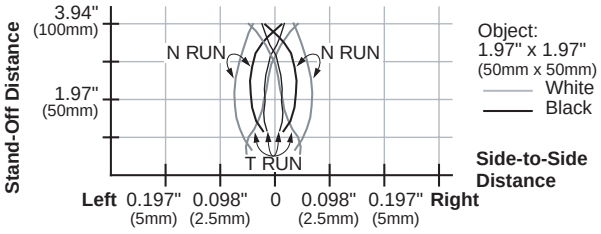
The beam spot is magnied for the purpose of these dimensions only.

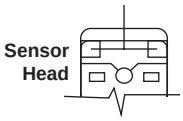
Effective Beam Characteristics

Infrared LED

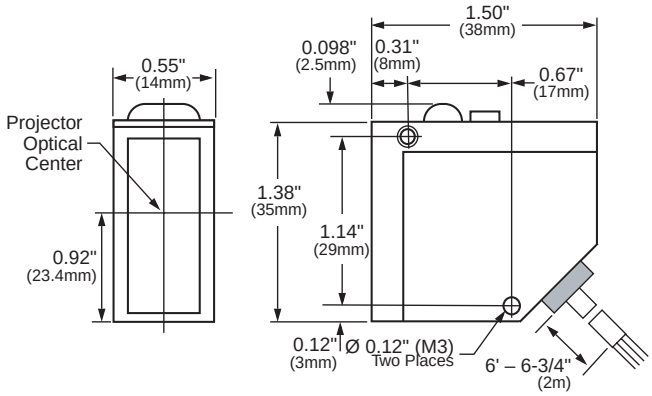


Red LED

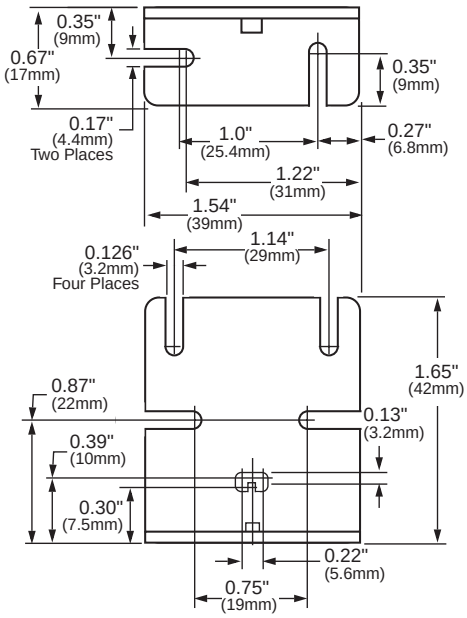




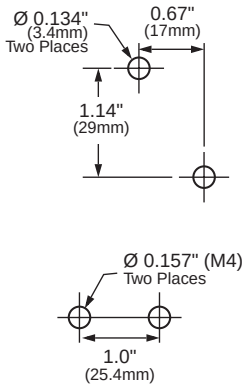
Dimensions



Mounting Bracket (attachment)
Aluminum 0.047" (1.2mm) Thick



Panel Cut-Out



When mounting bracket is used

Installation

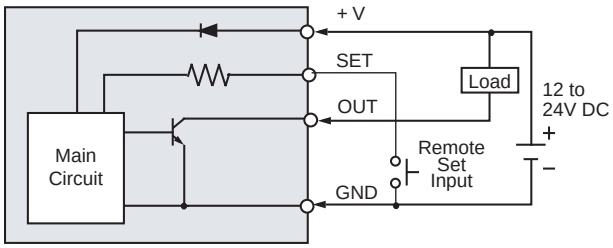
See for general sensor instructions. This section provides considerations specic to SA1L photo sensors.

Wiring

Wire Color	Name	Function
Brown	+V	12 to 24V DC, 40mA (maximum)
Black	OUT	Digital Output, 30V DC, 100mA
Pink	SET SELECT	Remote Set Input (1-channel) Channel Select Input (2-channel)
Blue	GND	Power Ground (0V)

Schematics

One-Channel (SA1L-LN1 and SA1L-LN1H) PNP Output also avaiable



Two-Channel (SA1L-LN1A and SA1L-LN1AH) PNP Output also avaiable