



Instruction Manual—SM Series™, Thru-beam and Polarized Reflex Photoelectric Sensors

The following models are covered in this manual:

THRU-BEAM

15M Range Models

E65-SMSTS15-HA	..... DC Source	..... Cable
E65-SMSTS15-HAD	..... DC Source	..... Connector
E65-SMTD15-HL	..... DC Detector	..... Cable Light Operate
E65-SMTD15-HD	..... DC Detector	..... Cable Dark Operate
E65-SMTD15-HLD	..... DC Detector	..... Connector Light Operate
E65-SMTD15-HDD	..... DC Detector	..... Connector Dark Operate

POLARIZED REFLEX

3M Range Models

E65-SMPR3-GL	..... AC/DC	..... 3-Wire	..... Cable	..... Light Operate
E65-SMPR3-GD	..... AC/DC	..... 3-Wire	..... Cable	..... Dark Operate
E65-SMPR3-GLD	..... AC/DC	..... 3-Wire	..... Connector	..... Light Operate
E65-SMPR3-GDD	..... AC/DC	..... 3-Wire	..... Connector	..... Dark Operate
E65-SMPR3-HL	..... DC	..... 4-Wire	..... Cable	..... Light Operate
E65-SMPR3-HD	..... DC	..... 4-Wire	..... Cable	..... Dark Operate
E65-SMPR3-HLD	..... DC	..... 4-Wire	..... Connector	..... Light Operate
E65-SMPR3-HDD	..... DC	..... 4-Wire	..... Connector	..... Dark Operate



WARNING

IN ORDER TO AVOID ELECTRIC SHOCK OR OTHER POSSIBLE INJURY:

- DO NOT USE THIS PRODUCT FOR HUMAN SAFETY APPLICATIONS. IT WAS NOT DESIGNED, TESTED OR RECOMMENDED FOR THIS USE.
- DO NOT USE THIS PRODUCT IN HAZARDOUS LOCATIONS (E. G. EXPLOSIVE ATMOSPHERES). IT WAS NOT DESIGNED, TESTED OR RECOMMENDED FOR THIS USE.
- INSURE THAT THE PRODUCT IS CONNECTED TO THE CORRECT POWER SUPPLY FOR THE APPLICATION. REFER TO THE WIRING DIAGRAMS IN THIS MANUAL.
- DO NOT USE TOOLS TO APPLY FORCE OR TORQUE DIRECTLY TO THE SENSOR BODY. ALIGN THE SENSOR BY HAND BEFORE TIGHTENING THE MOUNTING HARDWARE.
- USE ONLY #6 MOUNTING HARDWARE. USE OF LARGER HARDWARE CAN DAMAGE THE SENSOR AND POSSIBLY EXPOSE HAZARDOUS LIVE VOLTAGES.
- AC/DC CONNECTOR VERSION SENSORS ARE EQUIPPED WITH AN AC-TYPE CONNECTOR. THE USE OF DC POWER WITH AC-TYPE CONNECTORS MAY NOT CONFORM WITH ESTABLISHED STANDARDS.

INTRODUCTION

The SM Series is a cost-effective photoelectric sensor family for use in a variety demanding industrial applications. They have high optical performance for reliable sensing, and their compact size allows use in tight spaces.

The sensors feature TargetLock™ for easy installation and set up. TargetLock™ is a powerful alignment aid tells you exactly when the sensors are on target for optimum performance. Sensor status is quickly available at a glance from the highly visible indicating LEDs.

Thru-Beam Sensors

Thru-beam sensors consist of a source and detector positioned on opposite sides of a detection zone. The source emits visible red light, which is received by the detector. The detector output switches when this beam of light is either blocked (when set for dark operation), or completed (light operation).

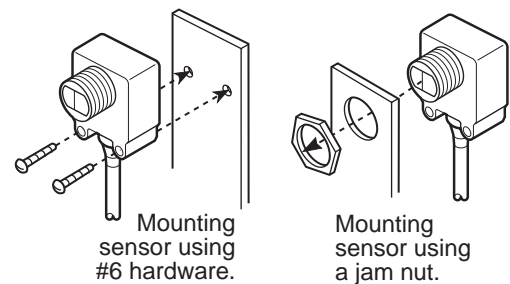
Polarized Reflex Sensors

A reflex sensor has both a light source and detector in the same unit. The source sends a beam of light to a retroreflector which returns it back to the detector. A break in the light beam causes the sensor to change output state. The visible red light beam aids in alignment of the sensor with its retroreflector.

Polarized models are used to reliably detect shiny targets that may reflect the light beam back to the sensor instead of interrupting the beam. The polarizing filter conditions the beam so that light reflected off the retroreflector is detected, but light reflected by the target is not.

MOUNTING

The SM sensor features two mounting holes in the rectangular section of the body for mounting to a surface with #6 or smaller hardware. In addition, the threaded barrel and jam nut allows mounting into any 0.75 inch (18.5 mm) hole, or a selection of accessory mounting brackets.



USING TARGETLOCK™

Alignment: The TargetLock LED provides a quick and easy way to set up the sensor for optimum operation. As you approach the best alignment and range, the LED changes from short flash, to long flash, to a solid ON condition. Refer to the set-up procedures in the next section.

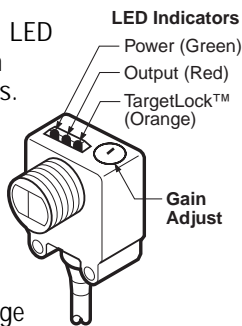
Maintenance: Another valuable feature of the TargetLock LED is to indicate the need for maintenance prior to loss of sensor operation. Observing a change from the normal operation of the LED when no target is present (for example, from solid ON to a long flash) indicates the gain has been reduced. This may be due to such things as sensor being bumped or vibrated out of alignment or contamination on the lens.

INDICATIONS AND ADJUSTMENTS

The SM Sensor features an advanced LED indicator display to provide information concerning sensor alignment and status.

Gain Adjustment

Thru-beam sensors include an adjustment control for optimizing the amount of gain for the application. The 3/4-turn pot provides a 10:1 adjustment of gain. A mechanical stop reduces the possibility of sensor damage due to over rotation.



LED	Function	State	Condition
Green	Power	ON	Power is applied to sensor
		OFF	No power
Red	Output	ON	Output is ON
		OFF	Output is OFF
		Flashing	Output is short circuited or overloaded
Orange	TargetLock™ Alignment Aid	ON	Excellent alignment—sensor is operating within optimum range
		Long Flash	Good alignment*
		Short Flash	Poor alignment*
		OFF	Target is present; sensor is out of alignment or If no target is present: beyond range

*A target that doesn't fully block the effective sensing beam or is translucent may cause a flashing indication and unreliable performance.

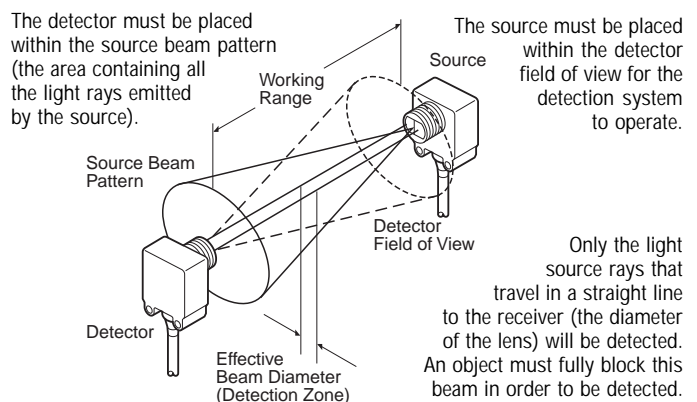
THRU-BEAM MOUNTING LOCATION AND SETUP

Mount the source and detector units so they are aimed directly at each other from opposite sides of the target. (The detector should be on the dirtier side because the light scattering effect of dirt collecting on the lens is less significant if it takes place at the detector.) Ensure that the area of the target to be detected will block the entire effective beam (see illustration at right). Apply power to both units.

Accurate sensing depends on proper alignment of the source and detector. To begin, position the source and detector in rough alignment so that source light is received by the detector and the TargetLock LED on the detector starts to flash. If the LED will not flash in any position, you may need to reduce the distance between the source and detector, or follow one or both of these two rough alignment methods:

1. The source emits visible red light. Look at the source with your eye positioned close to the detector. Mount the detector in the area where the source light is brightest.
2. Place a retroreflector over the lens of the detector. Look at the detector with your eye positioned close to the source. Mount the source in the area where the light reflected from the retroreflector is the brightest.

Obtain final alignment by rotating the detector back and forth in the horizontal axis to find the position where the TargetLock LED lights steady, or has the longest flash. Now tilt the detector up and down vertically to find the position where the LED lights steady or has the longest flash. Tighten the detector in place. Now repeat final alignment procedure for the source. If the LED will not light steady, decrease the distance between the source and detector and repeat this procedure. After alignment, tighten all mounting hardware.



POLARIZED REFLEX MOUNTING LOCATION AND SETUP

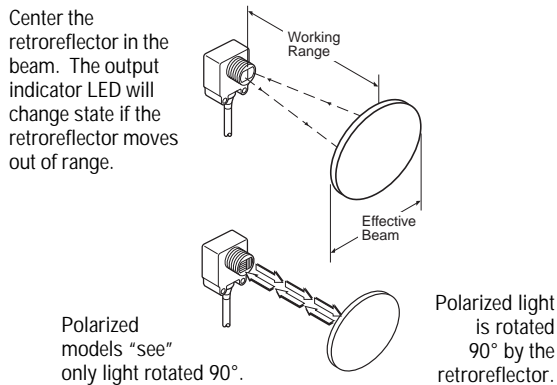


Retroreflective tapes can have vastly different properties than corner-cube reflectors. Polarized reflex sensors will not function with some types of tape. Also, signal strength can drop dramatically as the distance between tape and sensor is reduced. If you are using a polarized sensor, or intend to mount the tape closer than 12 inches from the sensor, we recommend that you test your particular tape prior to installation.

Position the sensor and retroreflector on opposite sides of the target. Ensure that the area of the target to be detected will block the entire beam.

With power applied to the sensor, aim the unit directly at the center of the retroreflector until the TargetLock LED starts to flash (if the LED will not flash in any position, you may need to reduce the distance between the sensor and the retroreflector). Rotate the sensor back and forth horizontally to find the position where the LED lights steady, or has the longest flash. Now tilt the sensor up and down vertically to find the position where the LED lights steady. If the TargetLock LED will not light steady, decrease the distance between the sensor and the retroreflector to increase gain, and repeat the alignment procedure. After alignment, tighten all mounting hardware.

Stretch wrap material over a shiny surface may reflect enough light to false trigger a polarized reflex sensor. In this case, tilt the alignment axis of the sensor relative to the shiny surface.

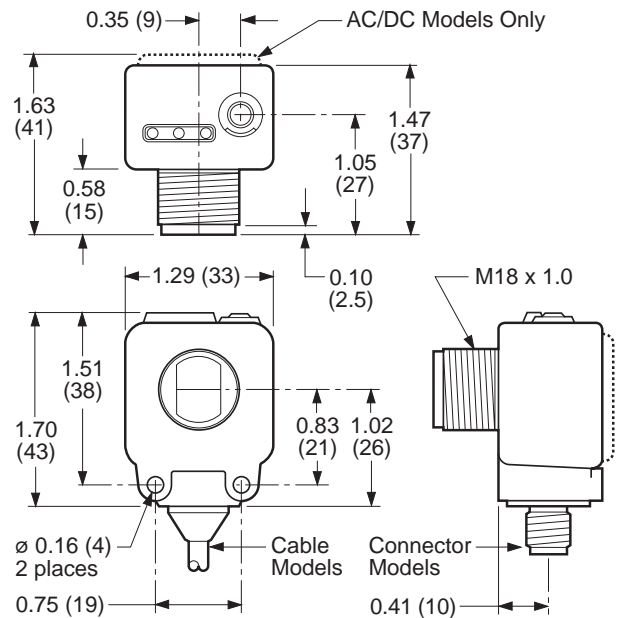


WIRING DIAGRAMS

Pin numbers are for reference only, rely on pin location when wiring.

Mode	Cable Models	Micro-Connector Models*
3-Wire AC/DC Models (18-264 VAC, 50/60 Hz or 18-50 VDC)		
All Sensors		
4-Wire DC Models (10-30 VDC)		
Thru-Beam Source		
All Others		

APPROXIMATE DIMENSIONS



SPECIFICATIONS

	AC/DC Models (AC Operation)	AC/DC Models (DC Operation)	DC Models
Input Voltage	18-264 VAC, 50/60 Hz	18-50 VDC	10-30 VDC
Power Dissipation	4 VA maximum	4 VA maximum	2 W maximum
Output Type	VMOS (bi-directional)	NPN (Sink)	NPN and PNP (dual outputs)
Current Switching	200 mA maximum	200 mA maximum	100 mA maximum
Voltage Switching	264 VAC	50 VDC	30 VDC maximum
Off-State Leakage	500 mA maximum	500 mA maximum	10 mA maximum
Surge Current	2 A maximum	2 A maximum	1 A maximum
On-State Voltage Drop	3.5 V maximum	3.5 V maximum	2.5 V maximum
Response Time	16 mS	1.5 mS	1 mS
Short Circuit Protection	Auto reset short circuit and overload protection (Output Indicator LED will flash); IMPORTANT: During installation, correct power connections must be made first to ensure fail-safe short circuit protection of the outputs.		
Light/Dark Operation	By model		
Temperature Range	Operating: -13° to +131° F (-25° to +55° C); Storage: -13° to +158° F (-25° to +70° C)		
Material of Construction	Lens: Polycarbonate; Cable jacket: PVC; Body: Cyclopol		
Cable/Connector	6.5 foot (2m) 4-wire cable; or 4-pin, micro connector (AC-key on AC/DC models; DC-key on DC models)		
Vibration and Shock	Vibration: 30 g over 10 Hz to 2 kHz; Shock: 50 g for 10 mS 1/2 sinewave pulse		
Indicator LEDs	Green LED: Power; Red LED: Output; Orange LED: TargetLock™		
Source Light	Visible Red, 660 nm		
Gain Adjustment	3/4-turn pot, 10:1 adjustment of gain (provided on thru-beam and diffuse reflective sensors only)		
Sunlight Immunity	Perfect Prox: 5,000 footcandles; All others: 10,000 foot-candles		
Enclosure Ratings	NEMA 1, 3, 4, 4X, 6, 6P, 12, and 13; IP 68 (Our products conform to NEMA tests as indicated, however, some severe washdown applications can exceed these NEMA test specifications. If you have questions about a specific application, contact our Applications Department.)		
Approvals	CE Compliant; Contact factory for the latest list of approvals		

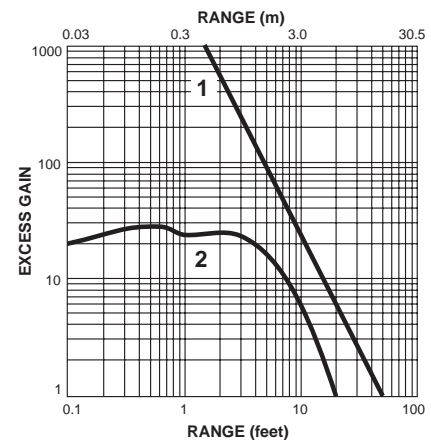
OPTICAL PERFORMANCE

All optical specifications are guaranteed to be the minimum performance under clean conditions of any product delivered from stock. Typical performance may be higher.

Dirt in the environment will affect optical performance by reducing the amount of light the control receives. For best results, sensors should be used at distances where excess gain is higher than 1.5 (1.5 times the amount of sensing power required to detect an object under ideal conditions). Higher excess gain will allow the sensor to overcome higher levels of contamination on the lens.

	Thru-Beam	Polarized Reflex
Maximum Range	50 feet (15 M)	10 feet (3 M)
Optimum Range	0.1 to 25 feet (30 mm to 7.5 M)	0.1 to 5 feet (30 mm to 1.5 M)
Field of View	10 inch (254 mm) diameter at 10 feet (3 M)	1 inch (25 mm) diameter at 50 inches (1.3 M)
Effective Beam	0.25 x 0.625 inches	- - -

1. Thru-Beam
2. Polarized Reflex (based on a 3-inch diameter retroreflector)



Still Need Help?

Contact the
Cutler-Hammer Sensor
Application Engineers

1-800-426-9184
Fax: 425-513-5356

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