EATON | Cutler-Hammer

August 2007

SM Series
Photoelectric Sensors

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The Cutler-Hammer® SM Series from Eaton's electrical business provides high performance and ease of use in an economical, compact package.

Lock In on Great Performance with TargetLock™

A sensor can have the greatest performance in the world, but if it is slightly misaligned or the target is positioned at the wrong range, you will have reliability problems sooner or later. TargetLock™ not only simplifies sensor setup but visually confirms your sensor is positioned to operate with the highest possible reliability. In addition, TargetLock™ provides diagnostic information during use to inform you of impending problems before they result in equipment downtime.

No Sensor Is Easier to Use

The SM Series includes many other features that simplify use. Visible sensing beams on all models show you exactly where the sensors are pointing. The durable housing features multiple mounting options to easily fit on your equipment in the tightest of spaces. Full protection from overvoltage, reverse polarity and short circuits reduces the chance of damage. Bright 360° LED indicators clearly show sensor status.

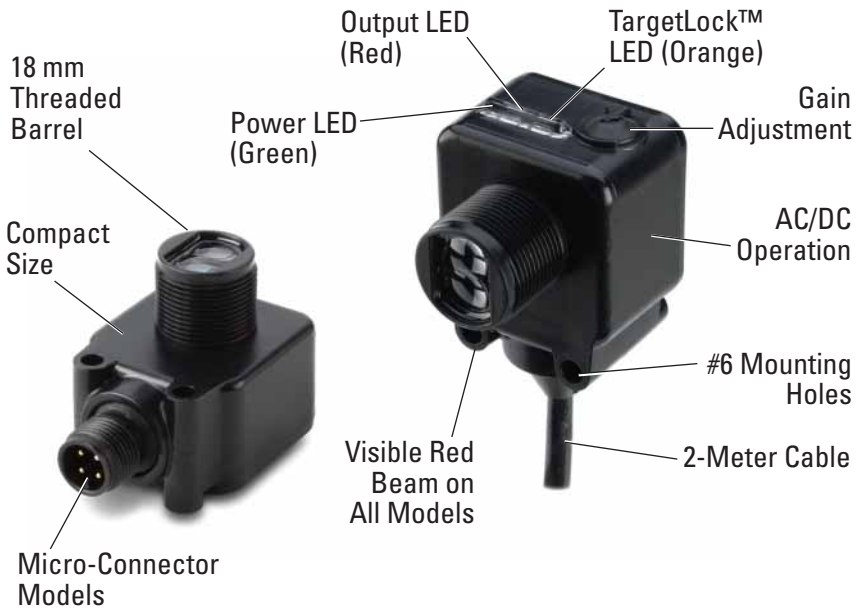
Approvals

- UL Listed
- C-UL Listed

CE

Unless otherwise noted, the products contained in this document are not designed or intended for use in human safety applications.

SM Series™ with TargetLock™
The *Easiest* Photoelectric Sensor to Set Up and Use



Product Features

- Highly visible LED indicators for power, output and TargetLock™
- TargetLock™ simplifies setup and ensures the sensor operates at the highest level of reliability possible
- Perfect Prox® models sense different colored targets at the same range and ignore objects in the background
- AC/DC models operate on either 18 – 264V AC or 18 – 50V DC
- DC-only models feature both NPN and PNP outputs
- Visible beam on all models let you see exactly where the sensor is pointing
- Compact size to fit in tight spaces
- Multiple mounting options including industry standard 18 mm threads
- Reverse polarity, overload and short circuit protection
- Full family includes thru-beam, polarized reflex, diffuse reflective and Perfect Prox® background rejection

Typical Applications

- Packaging Machines
- Conveyors and Other Material Handling Equipment
- Food Processing Equipment
- Assembly Machines
- Pharmaceutical Machines

For Customer Service in the U.S. call **1-800-356-1243**, in Canada call **1-800-268-3578**.
For Application Assistance in the U.S. and Canada call **1-800-426-9184**.

Unparalleled Optical Performance — Perfect Prox®

Exceptional background rejection sets Perfect Prox® apart from all other sensors. Just point the sensor's visible beam at the target and get reliable detection regardless of color, reflectance, contrast or surface shape, while ignoring background objects just a fraction of an inch away.

Fast and Easy Setup

The SM Series features an advanced 3-LED indicator display to provide valuable information at a glance. The bright display is clearly visible from 360°. In addition to LEDs for power and output status indication, the SM features a third LED that is part of the TargetLock™ system.

TargetLock™ is a microprocessor-controlled system that enables you to quickly and easily align the sensor and ensure it is operating most reliably.

- **Alignment:** The TargetLock™ LED provides a quick and easy way to set up the sensor for optimum operation. On initial setup, when you have achieved the minimum signal required for the sensor to operate, the TargetLock™ LED will blink in a short flash pattern. As you improve the setup and approach the best alignment and range, the LED changes from short flash to long flash to a solid ON condition. This means that even after you reach a point where the sensor will operate in the application, you are able to further fine tune the setup for highest reliability.
- **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 (for example, from solid ON to a long flash) indicates the gain has been reduced. Possible causes include bumping or vibrating out of alignment or contamination buildup on the lens. With the TargetLock™ LED, you are made aware of this condition before the sensor stops working, allowing you ample time to address the problem before your machine goes down.

The following chart details the function of each of the SM Series LED indicators.

LED	State	LED Condition (Thru-Beam/ Reflex)	LED Condition (Diffuse/ Perfect Prox®)
Power (Green)	ON	Power is applied to sensor	
	OFF	No power	
Output (Red)	ON	Output is ON	
	OFF	Output is OFF	
	Flashing	Output is short circuited or overloaded	
Target-Lock™ (Orange)	ON	Excellent alignment; sensor is operating within optimum range	Target present — excellent gain; sensor is operating within optimum range
	Long Flash	Good alignment ①	Target present — good gain
	Short Flash	Poor alignment ①	Target present — poor gain
	OFF	Target is present; If no target present: sensor is out of alignment or beyond range	No target, or sensor is beyond range

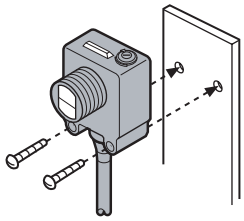
① A target that doesn't fully block the effective sensing beam or is translucent may cause a flashing indication and unreliable performance.

Gain Adjustment

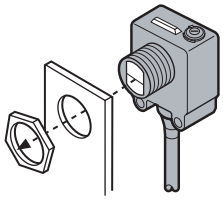
Thru-beam and diffuse reflective sensors include an adjustment control for optimizing the amount of gain for the application. The 3/4-turn pot provides a 10:1 adjustment of gain. A mechanical stop eliminates the possibility of sensor damage. Adjustment of the control does not require any special tools.

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. The threaded barrel and jam nut allows mounting into any 0.75 inch (19 mm) hole or a selection of accessory mounting brackets available from Eaton and detailed in **PG.05.03.T.E.**



Mounting sensor using #6 hardware.



Mounting sensor using a jam nut.

Mounted SM sensor in 18 mm Ball Swivel Bracket, as seen in **PG.05.03.T.E.**

Model Selection

	Operating Voltage	Sensing Range	Optimum Range	Cutoff Range	Field of View	Thru-Beam Component	Connection Type	Catalog Number	
								Light Operate	Dark Operate
3-Wire and 4-Wire Sensors									
Thru-Beam Source Detector For a complete system, order one Source and one Detector	10 – 30V DC	50 feet (15m)	0.1 to 25 feet (30 mm to 7.5m)	—	10 inch (254 mm) diameter at 10 feet (3m)	Source	2-meter Cable	**E65-SMTS15-HA**	
							4-pin Micro DC Connector	**E65-SMTS15-HAD** ⊛	
						Detector	2-meter Cable	**E65-SMTD15-HL**	**E65-SMTD15-HD**
							4-pin Micro DC Connector	**E65-SMTD15-HLD** ⊛	**E65-SMTD15-HDD** ⊛
Polarized Reflex Retroreflector (Not Included) Sensor For Complete System, Order Sensor and Retroreflector (See **PG.05E.17.T.E**)	18 – 264V AC 50/60 Hz or 18 – 50V DC	10 feet (3m)	0.1 to 5 feet (30 mm to 1.5m)	—	1 inch (25 mm) diameter at 50 inches (1.3m)	—	2-meter Cable	**E65-SMPR3-GL**	**E65-SMPR3-GD**
							4-pin Micro AC Connector	**E65-SMPR3-GLD** ⊛	**E65-SMPR3-GDD** ⊛
	10 – 30V DC	10 feet (3m)	0.1 to 5 feet (30 mm to 1.5m)	—	1 inch (25 mm) diameter at 50 inches (1.3m)	—	2-meter Cable	**E65-SMPR3-HL**	**E65-SMPR3-HD**
							4-pin Micro DC Connector	**E65-SMPR3-HLD** ⊛	**E65-SMPR3-HDD** ⊛
Diffuse Reflective	18 – 264V AC 50/60 Hz or 18 – 50V DC	8 inches (200 mm) ①	0.25 to 5 inches (6 mm to 127 mm)	—	2 inch (50 mm) diameter at 5 inches (127 mm)	—	2-meter Cable	**E65-SMSD200-GL**	**E65-SMSD200-GD**
							4-pin Micro AC Connector	**E65-SMSD200-GLD** ⊛	**E65-SMSD200-GDD** ⊛
	10 – 30V DC	8 inches (200 mm) ①	0.25 to 5 inches (6 mm to 127 mm)	—	2 inch (50 mm) diameter at 5 inches (127 mm)	—	2-meter Cable	**E65-SMSD200-HL**	**E65-SMSD200-HD**
							4-pin Micro DC Connector	**E65-SMSD200-HLD** ⊛	**E65-SMSD200-HDD** ⊛
Perfect Prox®	18 – 264V AC 50/60 Hz or 18 – 50V DC	2 inches (50 mm)	0.4 to 1.8 inches (10 mm to 45 mm)	2.3 inches (58 mm) and beyond ②	0.25 inch (6 mm) diameter at 2.25 inches (57 mm)	—	2-meter Cable	**E65-SMPP050-GL**	**E65-SMPP050-GD**
							4-pin Micro AC Connector	**E65-SMPP050-GLD** ⊛	**E65-SMPP050-GDD** ⊛
		4 inches (100 mm)	0.5 to 3 inches (13 mm to 76 mm)	5 inches (127 mm) and beyond ②	0.35 inch (9 mm) diameter at 5 inches (127 mm)	—	2-meter Cable	**E65-SMPP100-GL**	**E65-SMPP100-GD**
							4-pin Micro AC Connector	**E65-SMPP100-GLD** ⊛	**E65-SMPP100-GDD** ⊛
	10 – 30V DC	2 inches (50 mm)	0.4 to 1.8 inches (10 mm to 45 mm)	2.3 inches (58 mm) and beyond ②	0.25 inch (6 mm) diameter at 2.25 inches (57 mm)	—	2-meter Cable	**E65-SMPP050-HL**	**E65-SMPP050-HD**
							4-pin Micro DC Connector	**E65-SMPP050-HLD** ⊛	**E65-SMPP050-HDD** ⊛
		4 inches (100 mm)	0.5 to 3 inches (13 mm to 76 mm)	5 inches (127 mm) and beyond ②	0.35 inch (9 mm) diameter at 5 inches (127 mm)	—	2-meter Cable	**E65-SMPP100-HL**	**E65-SMPP100-HD**
							4-pin Micro DC Connector	**E65-SMPP100-HLD** ⊛	**E65-SMPP100-HDD** ⊛

① Nominal range — sensor will detect a 90% reflectance white card at this range.
② Sensor will ignore a 90% reflectance white card at this range.
Fast turn product with typical one business day lead-time to shipment.
⊛ See listing of compatible connector cables on **Page 4**.

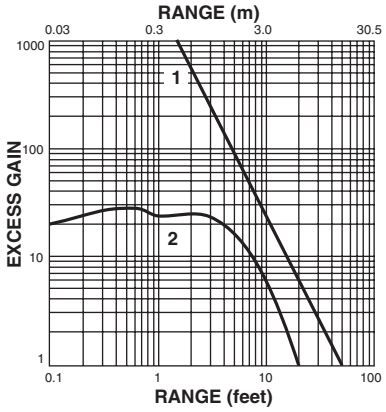
Model Selection — Compatible Connector Cables ①

	Voltage Style	Number of Pins	Gauge	Length	Catalog Number			Pin Configuration/Wire Colors (Face View Female Shown)
					PVC Jacket	PUR Jacket	IRR PUR Jacket	
Standard Cables — Micro Style								
Micro Style Straight Female	AC	4-pin 4-wire	22 AWG	6.0 feet (2m)	CSAS4F4CY2202	CSAS4F4RY2202	CSAS4F4IO2202	1-Red/Black 2-Red/White 3-Red 4-Green
	DC	4-pin 4-wire	22 AWG	6.0 feet (2m)	CSDS4A4CY2202	CSDS4A4RY2202	CSDS4A4IO2202	1-Brown 2-White 3-Blue 4-Black

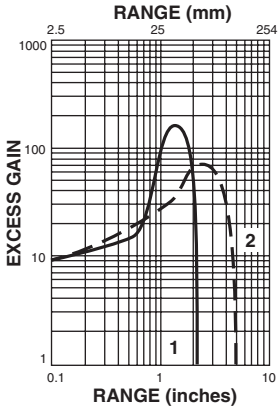
① For a full selection of connector cables, see **PG.05.05.T.E**.

Stocked product, typical order quantities guaranteed in stock.

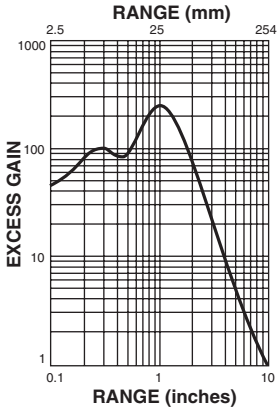
Excess Gain



1. Thru-Beam
2. Polarized Reflex (Based on a 3-Inch Diameter Retroreflector)



1. 50 mm Perfect Prox®
2. 100 mm Perfect Prox®

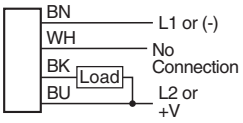
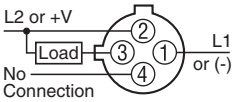
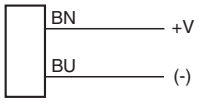
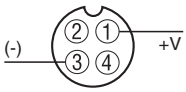
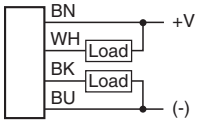
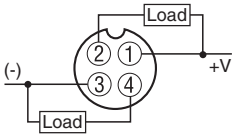


Diffuse Reflective
(Based on a 90% Reflectance White Card)

Model Selection — Accessories

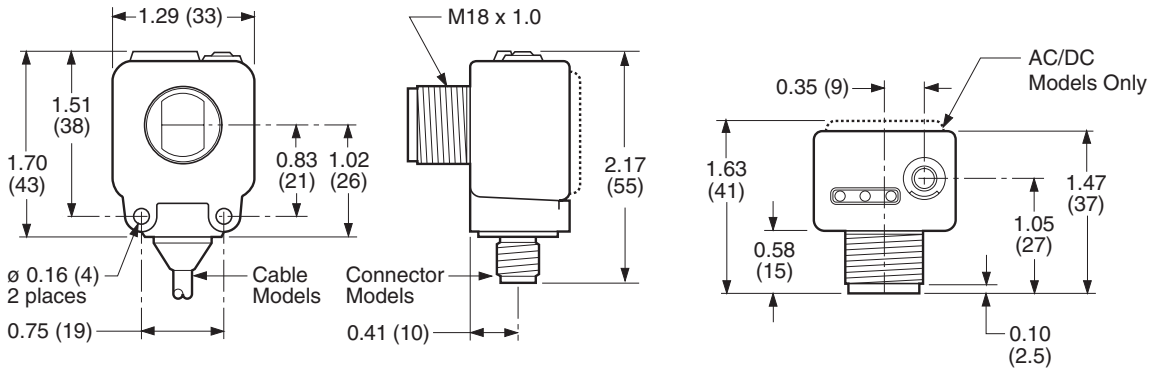
Description	Reference
Retroreflectors and Retroreflective Tape	See **PG.05E.17.T.E**
Mounting Brackets	See **PG.05.03.T.E**
Replacement Mounting Nuts and Other Accessories	See **PG.05.04.T.E**
Connector Cables	See **PG.05.05.T.E**

Wiring Diagrams (Pin numbers are for reference only, rely on pin location when wiring)

Operating Voltage	Mode	Cable Models	Micro-Connector Models (Face View Male Shown)
3-Wire Sensors			
18 – 264V AC, 50/60 Hz or 18 – 50V DC	All Sensors		
4-Wire Sensors			
10 – 30V DC	Thru-Beam Source		
	All Others		

Specifications

	AC/DC Models		DC Models
	AC Operation	DC Operation	
Input Voltage	18 – 264V AC, 50/60 Hz	18 – 50V DC	10 – 30V DC
Power Dissipation	4 VA maximum	4 VA maximum	2W 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	264V AC	50V DC	30V DC maximum
OFF-State Leakage	500 µA maximum	500 µA maximum	10 µA maximum
Surge Current	2A maximum	2A maximum	1A maximum
ON-State Voltage Drop	3.5V maximum	3.5V maximum	2.5V maximum
Response Time	16 mS	1 mS	1 mS
Protection	Short circuit and overload protection (Output Indicator LED will flash). Reverse polarity protection (Sensor will reset automatically once fault is removed). **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: Cycoloy		
Cable/Connector	Cable Models: 6.5 foot (2m) 4-wire cable; Connector Models: 4-pin, micro-connector (AC-key on AC/DC models; DC-key on DC models)		
Vibration and Shock	Vibration: 30g over 10 Hz to 2 kHz; Shock: 50g 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 foot-candles; All others: 10,000 foot-candles		
Enclosure Ratings	NEMA 1, 3, 4, 4X, 6, 6P, 12 and 13; IP68 ①		

① NOTE: 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.

Approximate Dimensions in Inches (mm)