



### SM Series Sensors

#### Product Description

The SM Series™ from Eaton's Electrical Sector 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.

#### Application Description

##### Typical Applications

- Packaging machines
- Conveyors and other material handling equipment
- Food processing equipment
- Assembly machines
- Pharmaceutical machines

### Contents

<i>Description</i>	<i>Page</i>
SM Series Sensors	
Product Overview .....	<b>V8-T5-49</b>
Product Selection	
SM Series Sensors .....	<b>V8-T5-50</b>
Compatible Connector Cables .....	<b>V8-T5-51</b>
Accessories .....	<b>V8-T5-51</b>
Technical Data and Specifications .....	<b>V8-T5-52</b>
Excess Gain .....	<b>V8-T5-52</b>
Wiring Diagrams .....	<b>V8-T5-53</b>
Dimensions .....	<b>V8-T5-53</b>

#### 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 18–264 Vac or 18–50 Vdc
- DC-only models feature both NPN and PNP outputs
- Visible beam on all models lets 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

#### Standards and Certifications

- UL Listed, E166051
- UL tested to Canadian safety standards
- CE (DC models only)
- RoHS Compliant



**⚠ DANGER**  
**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578. For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Product Overview**

**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.

See table (this page) for details of the function of each of the SM Series LED indicators.

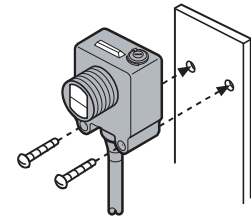
**Gain Adjustment**

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.

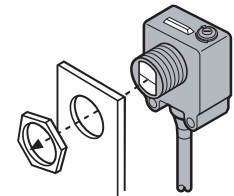
**Mounting**

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 allow mounting into any 0.75 in (19 mm) hole or a selection of accessory mounting brackets available from Eaton and detailed in **Tab 8, section 8.2**.

**Mounting Sensor using #6 Hardware**



**Mounting Sensor using a Jam Nut**



**Mounted SM Sensor in 18 mm Ball Swivel Bracket**  
See **Tab 8, section 8.2**.



**LED Indicators**

LED	State	Thru-Beam/Reflex LED Condition	Diffuse/ Perfect Prox LED Condition
<b>Power</b> (green)	ON	Power is applied to sensor	Power is applied to sensor
	OFF	No power	No power
<b>Output</b> (red)	ON	Output is ON	Output is ON
	OFF	Output is OFF	Output is OFF
	Flashing	Output is short circuited or overloaded	Output is short circuited or overloaded
<b>Target-Lock</b> (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

**Note**

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

### Product Selection

#### SM Series Sensors

5

#### Three-Wire and Four-Wire Sensors

	Operating Voltage	Sensing Range	Optimum Range	Cutoff Range	Field of View	Thru-Beam Component	Connection Type	Light Operate Catalog Number	Dark Operate Catalog Number
<b>Thru-Beam</b> <sup>①</sup>									
 <p>Source      Detector</p>	<b>Thru-Beam</b>								
	10–30 Vdc	50 ft (15 m)	0.1 to 25 ft (30 to 7.5 m)	—	10 in (254 mm) diameter at 10 ft (3 m)	Source	2m cable	<b>E65-SMST15-HA</b>	<b>E65-SMST15-HA</b>
							4-pin micro DC connector	<b>E65-SMST15-HAD</b> ☹	<b>E65-SMST15-HAD</b> ☹
						Detector	2m cable	<b>E65-SMTD15-HL</b>	<b>E65-SMTD15-HD</b>
							4-pin micro DC connector	<b>E65-SMTD15-HLD</b> ☹	<b>E65-SMTD15-HDD</b> ☹
<b>Polarized Reflex</b> <sup>②</sup>									
 <p>Retro-reflector      Sensor</p>	<b>Polarized Reflex</b>								
	18–264 Vac 50/60 Hz or 18–50 Vdc	10 ft (3 m)	0.1 to 5 ft (30 to 1.5 m)	—	1 in (25 mm) diameter at 50 in (1.3 m)	—	2m cable	<b>E65-SMPR3-GL</b>	<b>E65-SMPR3-GD</b>
							4-pin micro AC connector	<b>E65-SMPR3-GLD</b> ☹	<b>E65-SMPR3-GDD</b> ☹
	10–30 Vdc	10 ft (3 m)	0.1 to 5 ft (30 to 1.5 m)	—	1 in (25 mm) diameter at 50 in (1.3 m)	—	2m cable	<b>E65-SMPR3-HL</b>	<b>E65-SMPR3-HD</b>
						4-pin micro DC connector	<b>E65-SMPR3-HLD</b> ☹	<b>E65-SMPR3-HDD</b> ☹	
<b>Diffuse Reflective</b>									
	<b>Diffuse Reflective</b>								
	18–264 Vac 50/60 Hz or 18–50 Vdc	8 in (200 mm) <sup>③</sup>	0.25 to 5 in (6 to 127 mm)	—	2 in (50 mm) diameter at 5 in (127 mm)	—	2m cable	<b>E65-SMSD200-GL</b>	<b>E65-SMSD200-GD</b>
							4-pin micro AC connector	<b>E65-SMSD200-GLD</b> ☹	<b>E65-SMSD200-GDD</b> ☹
	10–30 Vdc	8 in (200 mm) <sup>③</sup>	0.25 to 5 in (6 to 127 mm)	—	2 in (50 mm) diameter at 5 in (127 mm)	—	2m cable	<b>E65-SMSD200-HL</b>	<b>E65-SMSD200-HD</b>
						4-pin micro DC connector	<b>E65-SMSD200-HLD</b> ☹	<b>E65-SMSD200-HDD</b> ☹	
<b>Perfect Prox</b>									
	<b>Perfect Prox</b>								
	18–264 Vac 50/60 Hz or 18–50 Vdc	2 in (50 mm)	0.4 to 1.8 in (10 to 45 mm)	2.3 in (58 mm) and beyond <sup>④</sup>	0.25 in (6 mm) diameter at 2.25 in (57 mm)	—	2m cable	<b>E65-SMPP050-GL</b>	<b>E65-SMPP050-GD</b>
							4-pin micro AC connector	<b>E65-SMPP050-GLD</b> ☹	<b>E65-SMPP050-GDD</b> ☹
		4 in (100 mm)	0.5 to 3 in (13 to 76 mm)	5 in (127 mm) and beyond <sup>④</sup>	0.35 in (9 mm) diameter at 5 in (127 mm)	—	2m cable	<b>E65-SMPP100-GL</b>	<b>E65-SMPP100-GD</b>
							4-pin micro AC connector	<b>E65-SMPP100-GLD</b> ☹	<b>E65-SMPP100-GDD</b> ☹
	10–30 Vdc	2 in (50 mm)	0.4 to 1.8 in (10 to 45 mm)	2.3 in (58 mm) and beyond <sup>④</sup>	0.25 in (6 mm) diameter at 2.25 in (57 mm)	—	2m cable	<b>E65-SMPP050-HL</b>	<b>E65-SMPP050-HD</b>
							4-pin micro DC connector	<b>E65-SMPP050-HLD</b> ☹	<b>E65-SMPP050-HDD</b> ☹
		4 in (100 mm)	0.5 to 3 in (13 to 76 mm)	5 in (127 mm) and beyond <sup>④</sup>	0.35 in (9 mm) diameter at 5 in (127 mm)	—	2m cable	<b>E65-SMPP100-HL</b>	<b>E65-SMPP100-HD</b>
						4-pin micro DC connector	<b>E65-SMPP100-HLD</b> ☹	<b>E65-SMPP100-HDD</b> ☹	

#### Notes

- ☹ See listing of compatible connector cables on **Page V8-T5-51**.
- ① For a complete system, order one source and one detector
- ② For complete system, order sensor and retroreflector (see **Tab 8, section 8.1**).
- ③ Nominal range—sensor will detect a 90% reflectance white card at this range.
- ④ Sensor will ignore a 90% reflectance white card at this range.

**Compatible Connector Cables**

**Micro-Style,  
Straight Female**



**Standard Cables—Micro** ①

Voltage Style	Number of Pins	Gauge	Length	Pin Configuration/Wire Colors (Face View Female Shown)	PVC Jacket Catalog Number	PUR Jacket Catalog Number	IRR PUR Jacket Catalog Number
<b>Micro-Style, Straight Female</b>							
AC	4-pin, 4-wire	22 AWG	6 ft (2 m)		<b>CSAS4F4CY2202</b>	<b>CSAS4F4RY2202</b>	<b>CSAS4F4IO2202</b>
DC	4-pin, 4-wire	22 AWG	6 ft (2 m)		<b>CSDS4A4CY2202</b>	<b>CSDS4A4RY2202</b>	<b>CSDS4A4IO2202</b>

**Accessories**

**SM Series Sensors**

Description	Reference
Retroreflectors and retroreflective tape	See <b>Tab 8, section 8.1</b>
Mounting brackets	See <b>Tab 8, section 8.2</b>
Replacement mounting nuts and other accessories	See <b>Tab 8, section 8.3</b>
Connector cables	See <b>Tab 10, section 10.1</b>

**Note**

① For a full selection of connector cables, see **Tab 10, section 10.1**.

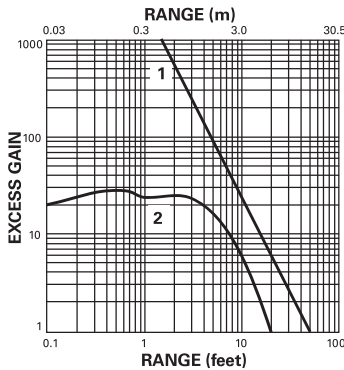
### Technical Data and Specifications

#### SM Series Sensors

Description	AC/DC Model AC Operation Specification	DC Operation Specification	DC Model Specification
Input voltage	18–264 Vac, 50/60 Hz	18–50 Vdc	10–30 Vdc
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	264 Vac	50 Vdc	30 Vdc maximum
OFF-state leakage	500 $\mu$ A maximum	500 $\mu$ A maximum	10 $\mu$ A 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	①	①	①
Light/dark operation	By model	By model	By model
Temperature range			
Operating	–13° to 131°F (–25° to 55°C)	–13° to 131°F (–25° to 55°C)	–13° to 131°F (–25° to 55°C)
Storage	–13° to 158°F (–25° to 70°C)	–13° to 158°F (–25° to 70°C)	–13° to 158°F (–25° to 70°C)
Material of construction	Lens: Polycarbonate; cable jacket: PVC; body: Cyclopol	Lens: Polycarbonate; cable jacket: PVC; body: Cyclopol	Lens: Polycarbonate; cable jacket: PVC; body: Cyclopol
Cable/connector	Cable models: 6 ft (2 m) four-wire cable; connector models: 4-pin, micro-connector (AC-key on AC/DC models; DC-key on DC models)	Cable models: 6 ft (2 m) four-wire cable; connector models: 4-pin, micro-connector (AC-key on AC/DC models; DC-key on DC models)	Cable models: 6 ft (2 m) four-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	Vibration: 30g over 10 Hz to 2 kHz; shock: 50g for 10 ms 1/2 sinewave pulse	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	Green LED: Power; red LED: Output; orange LED: TargetLock	Green LED: Power; red LED: Output; orange LED: TargetLock
Source light	Visible red, 660 nm	Visible red, 660 nm	Visible red, 660 nm
Gain adjustment	3/4-turn pot, 10:1 adjustment of gain (provided on thru-beam and diffuse reflective sensors only)	3/4-turn pot, 10:1 adjustment of gain (provided on thru-beam and diffuse reflective sensors only)	3/4-turn pot, 10:1 adjustment of gain (provided on thru-beam and diffuse reflective sensors only)
Sunlight immunity	Perfect Prox 5000 ft-candles; all others: 10,000 ft-candles	Perfect Prox 5000 ft-candles; all others: 10,000 ft-candles	Perfect Prox 5000 ft-candles; all others: 10,000 ft-candles
Enclosure ratings	NEMA 1, 3, 4, 4X, 6, 6P, 12 and 13; IP68, IP69	NEMA 1, 3, 4, 4X, 6, 6P, 12 and 13; IP68, IP69	NEMA 1, 3, 4, 4X, 6, 6P, 12 and 13; IP68, IP69

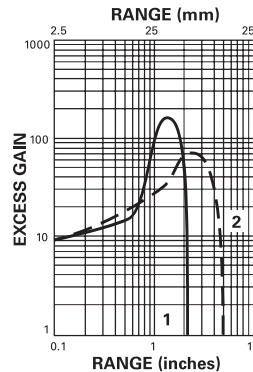
#### Excess Gain

##### Thru-Beam



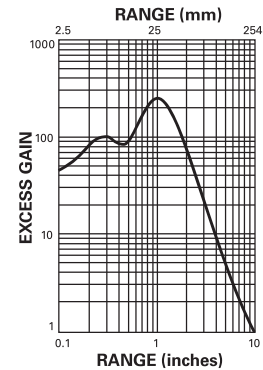
1. Thru-beam
2. Polarized reflex (based on a 3 in diameter retroreflector)

##### Perfect Prox



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

##### Diffuse Reflective



Diffuse reflective (based on a 90% reflectance white card)

#### Note

- ① 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.

### Wiring Diagrams

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

#### SM Series Sensors

Operating Voltage	Mode	Cable Model	Micro-Connector Model (Face View Male Shown)
<b>Three-Wire Sensors</b>			
18–264 Vac, 50/60 Hz or 18–50 Vdc	All sensors		
<b>Four-Wire Sensors</b>			
10–30 Vdc	Thru-beam source		
	All others		

### Dimensions

Approximate dimensions in inches (mm)

#### SM Series Sensors

