General Purpose Photoelectric Sensor

SMARTEYE® MARK III

Miniature High Performance Sensor

The **SMARTEYE® MARK III** is the "first" high performance photoelectric sensor in a miniature size that you can use anywhere... for any task... including your toughest industrial sensing applications. The *SMARTEYE® MARK III* is loaded with features and benefits, never before offered in a miniature sensor, including extremely high gain and high speed of response (50 microseconds). High gain enables the sensor to resolve the most difficult low contrast sensing tasks. High speed response provides resolution of the exact position of objects traveling at high speeds.

You can easily optimize the *SMARTEYE® MARK III* to conform to your particular sensing task because of its unique modular construction.

OFFSET/EDR® ADJUSTMENT
(Patent No. 5,621,205)
With the Offset/EDR® adjustment feature, the *SMARTEYE® MARK III* sensor can resolve very low contrast sensing tasks over a wider range of light intensities, including proper operation at high light levels. In addition, EDR® improves background suppression.

Please note that as the OFFSET/EDR® adjustment is rotated in the counterclockwise direction, the green EDR® indicator LED will begin to turn on and glow dimly. As the counter clock wise rotation proceeds, the intensity of the EDR® indicator will continue to increase. This indicator provides the installer an idea of just where in the overall dynamic operating range of the sensor the OFFSET/EDR® adjustment has been set. For example, if after adjustment to obtain maximum contrast deviation the OFFSET/EDR® is "off," the sensor is operating under very low received light conditions. If the EDR® indicator is fully lit, the sensor is operating under very high received light conditions. The concept of how to interpret the green EDR® indicator is simple – after adjustment this indicator should not be fully lit or completely off. Anywhere in between indicates that the sensor is operating within its dynamic operating range.

Features

- Response time (50 microseconds)
- Enhanced Dynamic Range
- Interchangeable optical blocks
- Clutched offset adjustment
- Operational from 12 to 24 VDC…(polarity protected)
- Choice with infrared, red, white, or blue LED
- 10-LED CONTRAST INDICATOR
- Built-in connector
- Waterproof housing
- NPN and PNP output transistors
- Short circuit protection
- Light On/Dark on selector switch
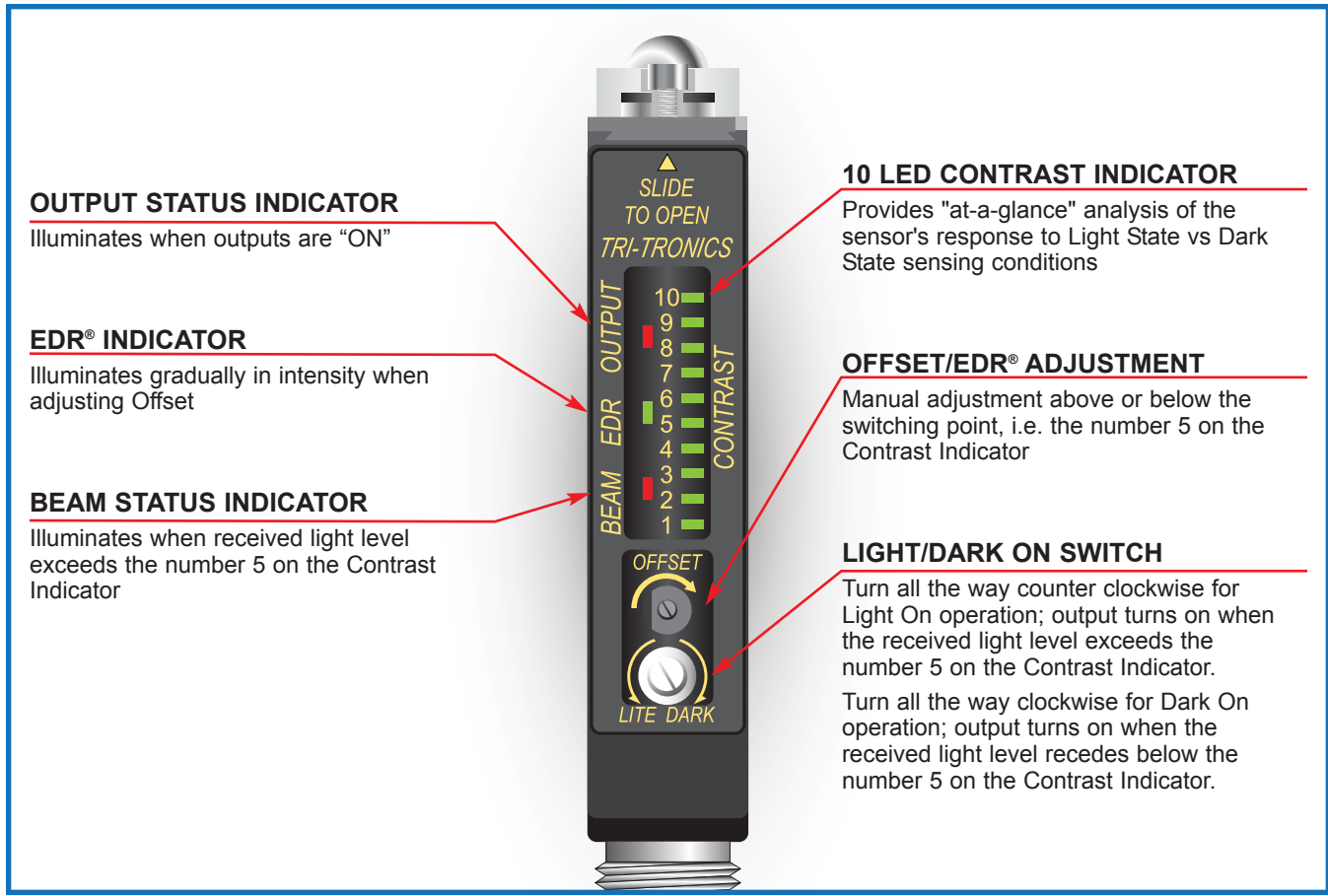- Anti-pulsing protection on power up

Benefits

- Accurate and repeatable
- Easy to setup
- Easy to maintain
- Lower maintenance costs
- Lower inventory costs
- Adaptable and flexible for many applications

Applications

- Printing/Coding/Marking
- Registration mark sensing
- High speed counting
- Low contrast inspection sensing
- Label applicator product detector
- Small parts detection

800-237-0946 • ttco.com
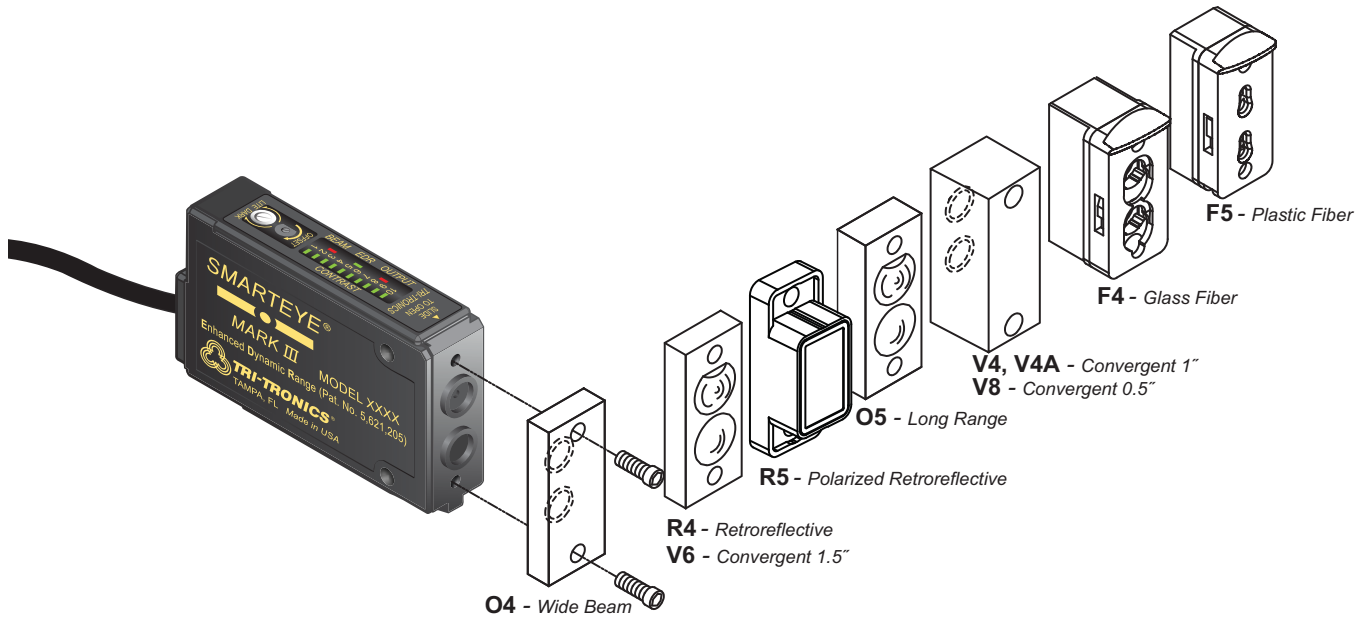
Light Source Guidelines

INVISIBLE INFRARED LIGHT SOURCE (880nm)

A. Best choice in most opaque object sensing tasks

B. Provides longest possible sensing range in either Beam Make or Beam Break sensing modes

C. Best choice in hostile environments; useful in penetrating lens contamination

D. Preferred for use with small glass fiberoptic light guides *Note: Do not use IR light with plastic fiberoptic light guides.*

E. Preferred when sensing dark colored objects in the proximity (Beam Make) mode, i.e., black, blue, green, etc.

F. Useful in penetrating containers for verification of contents; also useful in detecting overlapped splices in dense materials

G. Color perception; tends to favor blue colored objects

BLUE LIGHT SOURCE (480nm)

A. Useful for detecting translucent, transparent, plastic, or glass objects in the retroreflective mode when using the R4 optical block

B. Used as blue filter for color perception advantages, i.e., resolving yellow vs. white colored objects or printed registration marks

RED LIGHT SOURCE (660nm)

A. Best choice for use with plastic fiberoptic light guides

B. Useful when sensing translucent objects in proximity (Beam Make) mode

C. Useful when sensing transparent objects in fiber optic retroreflective (Beam Break) mode

D. Can be polarized for retroreflective (Beam Break) sensing to reduce proxing on shiny objects

E. Opposed fiberoptic light guides can be polarized for sensing some translucent plastic containers; consult factory for details

F. Used as red filter for color perception advantages

WHITE LIGHT SOURCE

(Broadband Color Spectrum)

A. Best choice for detecting all printed registration marks on packaging material

B. Recommended for detecting dark colored objects in the proximity (Beam Make) mode

C. Best choice for sorting colored objects

OUTPUT STATUS INDICATOR

Illuminates when outputs are "ON"

EDR® INDICATOR

Illuminates gradually in intensity when adjusting Offset

BEAM STATUS INDICATOR

Illuminates when received light level exceeds the number 5 on the Contrast Indicator

10 LED CONTRAST INDICATOR

Provides "at-a-glance" analysis of the sensor's response to Light State vs Dark State sensing conditions

OFFSET/EDR® ADJUSTMENT

Manual adjustment above or below the switching point, i.e. the number 5 on the Contrast Indicator

LIGHT/DARK ON SWITCH

Turn all the way counter clockwise for Light On operation; output turns on when the received light level exceeds the number 5 on the Contrast Indicator.

Turn all the way clockwise for Dark On operation; output turns on when the received light level recedes below the number 5 on the Contrast Indicator.

Optical Block Selection

SMARTEYE®
MARK III

Interchangeable optical blocks provide for universal application of the **SMARTEYE® MARK III** to any sensing applications from large object sensing to finite sensing of small parts, registration mark detection and product inspection tasks.

F5 - *Plastic Fiber*

F4 - *Glass Fiber*

V4, V4A - *Convergent 1″*
V8 - *Convergent 0.5″*

O5 - *Long Range*

R5 - *Polarized Retroreflective*

R4 - *Retroreflective*
V6 - *Convergent 1.5″*

O4 - *Wide Beam*

Type O4
Proximity
Wide beam optics useful for short-range sensing of transparent, translucent, opaque, or irregular shaped shiny objects.

Type O5
Proximity
Narrow beam optics useful in long-range sensing of medium to large size objects.

Type R4
Retroreflective
Very narrow beam optics designed to sense reflectors or reflective materials at long range. Designed for Beam Break sensing.

Type R5
Polarized Anti-Glare Retroreflective
Polarized to reduce response to "hot spot" glare from shiny surface of detected object. Use with visible light source.

Type F4
Glass Fiberoptics
Adapter for use with a wide variety of glass fiberoptic light guides for both the proximity and opposed sensing modes.

Type F5
Plastic Fiberoptics
Adapter for use with a wide variety of plastic fiberoptic light guides for both the proximity and opposed sensing modes

Type V4, V4A
Convergent 1" "V" Axis
Useable range of 1" to 5".

Type V6
Convergent 1.5" "V" Axis
Useable range of 1.5" to 8".

Type V8
Convergent .5" "V" Axis
Useable range of .25" to 5"

Narrow beam optics useful for sensing small parts. Also useful for proximity sensing to minimize response to reflected light from background objects..

Sensing Range Guidelines

Convergent / Proximity / Retroreflective					Glass Fiber Optics					Plastic Fiber Optics		
OPTICAL BLOCKS	IR	RED	BLUE	WHITE	OPTICAL BLOCKS	IR	RED	BLUE	WHITE	OPTICAL BLOCKS	RED	WHITE
V4, V4A	1 in.	1 in.	1 in.	1 in.	Opposed Mode					Opposed Mode		
V6	1.5 in.	1.5 in.	1.5 in.	1.5 in.	F4	3 ft.	1 ft.	8 in.	5 in.	F5	9 in.	2 in.
V8	0.5 in.	0.5 in.	0.5 in.	0.5 in.	F4 w/lens	20+ ft.	20+ ft.	12 ft.	9 ft.	F5 w/lens	6 ft.	2 ft.
O4	1.5 ft.	11 in.	4 in.	3 in.						F5 w/right angle lens	3 ft.	1 ft.
O5	4 ft.	3 ft.	1.5 ft.	1 ft.	Proximity Mode					Proximity Mode		
R4	20+ ft.	18+ ft.	6 ft.	5 ft.	F4	7 in.	5 in.	1 in.	1 in.	F5	7 in.	5 in.
R5	N/A	7 ft.	4 ft.	3 ft.	F4 w/lens	1 ft.	1 ft.	N/A	6 in.	F5 w/lens	1 ft.	1 ft.

NOTE: Proximity test utilized a 90% reflective white target. Retroreflective tests utilized a 3″ diam. round reflector, Model AR-3

NOTE: Range tests utilized a .125″ diam. fiber bundle

NOTE: Range tests utilized a .040″ diam. fiber

800-237-0946 • ttco.com

How To Specify

1. Select sensor model based on light source required
   SE3I = Infrared   SE3B = Blue
   SE3R = Red   SE3WL = White

2. Select connection required:
   Blank = Cable
   C = Connector

3. Select Optical Block based on mode of sensing required
   (see Range Guidelines)

NOTE: DRB-1 Bracket included

Example: SE3   R   C   F4

SMARTEYE® MARK III

Light Emitter

Connector

Optical Block
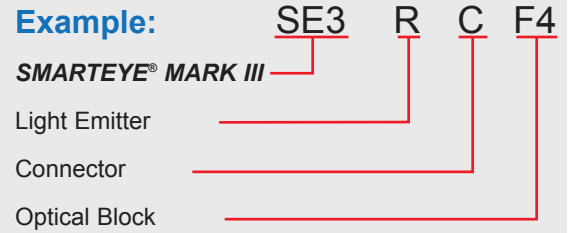
Accessories

Micro Cable Selection Guide, 4-wire M12

Yellow Shielded Cable Assemblies

SEC-6
6' (1.8m) cable with connector

SEC-15
15' (4.6m) cable with connector

SEC-25
25' (7.62m) cable with connector

RSEC-6
6' (1.8m) cable / right angle conn.

RSEC-15
15' (4.6m) cable / right angle conn.

RSEC-25
25' (7.62m) cable / right angle conn.

**Black Shielded Cable Assemblies
(Lightweight)**

BSEC-6
6' (1.8m) cable with connector

BSEC-15
15' (4.6m) cable with connector

BSEC-25
25' (7.62m) cable with connector

BRSEC-6
6' (1.8m) cable / right angle **conn.**

BRSEC-15
15' (4.6m) cable / right angle conn.

BRSEC-25
25' (7.62m) cable / right angle conn.

BX-10
10' (3.1m) Extension cable

BX-25
25' (7.62m) Extension cable

Grey Unshielded Cable Assemblies

SEC-2MU
6.5' (2.0m) Low-cost

GSEC-5MU
16.4' (5.0m) Low-cost

SEB-3
Stainless "L" Bracket

TA-18
18mm Adapter

DRB-1
Bracket

FMB-1 (8.4mm diam.)
Standard Fiberoptic
Mounting Bracket

MB-18
18mm Bracket

FMB-2 (5.1mm diam.)
FMB-3 (3.1mm diam.)
Miniature Glass or Plastic
Fiberoptic Mounting
Brackets

Specifications

SMARTEYE® MARK III

SUPPLY VOLTAGE
• 12 to 24 VDC
• Polarity Protected

CURRENT REQUIREMENTS
• 85mA (exclusive of load)

OUTPUT TRANSISTORS
• (1) NPN and (1) PNP Output transistor:
• NPN: Sink up to 150mA
• PNP: Source up to 150mA
• Momentary short circuit protected
• Outputs protected from pulsing during power up
• Light/dark switch determines Output Status:
  Light = Light "ON" operate
  Dark = Dark "ON" operate

RESPONSE TIME
• Minimum duration of input event
• Light state response = 50 microseconds
• Dark state response = 140 microseconds
• Leading edge Variation less than 20 microseconds

LIGHT IMMUNITY
• Responds to sensor's pulsed modulated light source
• Immune to most ambient light

HYSTERESIS
• Less than 400 millivolts for maximum sensitivity and resolution

LED LIGHT SOURCE
• Pulse modulation rate 45KHZ
• Choice of color:
  A. Infrared = 880nm
  B. Red = 660nm
  C. White = Broadband Color Spectrum
  D. Blue = 480nm

INDICATORS
• OUTPUT INDICATOR – RED LED illuminates when the output transistors are in the "ON" state as determined by the position of the Light/Dark switch
• BEAM STATUS INDICATOR – RED LED illuminates when returned light level exceeds "5" on the CONTRAST INDICATOR
• EDR® INDICATOR – Intensity of GREEN LED provides indication of where in the dynamic operating range the OFFSET/EDR® adjustment has been set
• CONTRAST INDICATOR – Displays scaled reading of sensor's response to contrasting light levels (light vs. dark) on a 10 bar LED display

OFFSET/EDR® ADJUSTMENT
• Sets initial level on CONTRAST INDICATOR in relation to mid-scale switch point of 5 – functions as sensitivity adjustment
• Controls Enhanced Dynamic Range circuit (EDR®) which functions to avoid saturation

AMBIENT TEMPERATURE
• -40°C to 70°C (-40°F to 158°F)

RUGGED CONSTRUCTION
• Chemical resistant housing
• Waterproof, NEMA 4X, 6P and IP67 enclosure ratings
• Epoxy encapsulated for mechanical strength

RoHS Compliant
Product subject to change without notice

Connections and Dimensions — SMARTEYE® MARK III PHOTOELECTRIC SENSOR

800-237-0946 • ttco.com