



Smart Sensing Solutions Since 1954



High Performance Sensor with
"Enhanced Dynamic Range"



High Performance Sensor

The **SMARTEYE® MARK II** sensor is one of TRI-TRONICS' most popular photoelectric sensors. The **SMARTEYE® MARK II** features extremely high gain combined with high speed. These high performance sensors were designed to resolve the most difficult sensing tasks. In addition to superior high gain/high speed, the **SMARTEYE® MARK II** is equipped with many new improvements.

Among the many features included in the design of the **SMARTEYE® MARK II**, none is more important than the **EDR®** circuit. With **EDR®** (Enhanced Dynamic Range), the dynamic operating range has been extended and background suppression has been enhanced.

Also included in the design of the new **SMARTEYE® MARK II** are all of the proven features included in all **SMARTEYE®** sensors, including our unique Contrast Indicator. The **SMARTEYE® MARK II** sets a new standard of performance in photoelectric sensing. When the sensing task involves resolving critical identifying features such as size, texture, distance, opacity, depth, or color, the **SMARTEYE® MARK II** provides that extra measure of performance that is often required to ensure proper operation.



Features

- Response time (50 microseconds)
- Enhanced Dynamic Range
- Seven interchangeable optical blocks
- Clutched offset adjustment
- Operational from 12 to 24VDC...(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

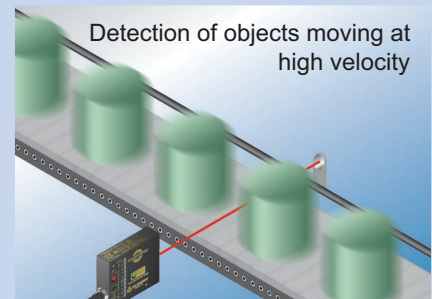
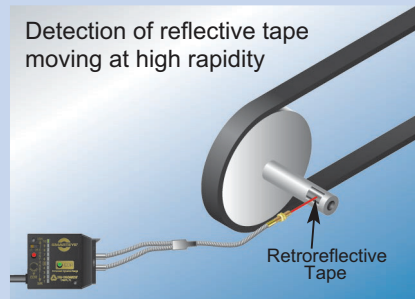
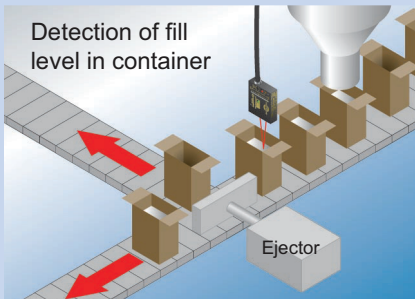
Benefits

- 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

Typical Applications



EDR® Enhanced Dynamic Range



(Patent No. 5,621,205)

The EDR® circuit extends the dynamic operating range to provide unequalled performance at bright light levels.

Eliminates Saturation

Every photoelectric sensor has a saturation point – a point at which any further increase in received light level to its detector will not result in any further internal signal level increase. This is apparent on the SMARTEYE's Contrast Indicator. For example, in an object sensing task, if the background (for example white conveyor belt) is reflecting enough light back to the sensor's detector to reach the sensor's saturation level, the arrival of an object will not result in any signal level increase as displayed on the Contrast Indicator. This undesirable condition is referred to as saturation.

To avoid saturation and enhance background suppression, the EDR® circuit monitors the offset adjustment during setup to determine when the sensor's operating level is approaching the sensor's light level saturation point. Before saturation occurs, the EDR® circuit adjusts the sensor in such a unique manner so as to prevent saturation and extends the overall dynamic range of the SMARTEYE® MARK II sensor.

Proximity Sensing Mode Advantages

Another performance benefit provided by the EDR® circuit when operating in the proximity mode is that the SMARTEYE® MARK II does not typically require the use of convergent or triangulating optics to resolve objects resting on shiny or highly reflective backgrounds. Instead, the optics can be divergent,

allowing a wider field of view. The larger the area in view of the sensor's optics, the greater the contrast deviation.

Convergent or triangulating optics results in pinpoint spots of light. These optical sensing methods can result in falsely switching the sensor's output by responding to minute surface variations or imperfections. A wider field of view offered by divergent optics allows the SMARTEYE® MARK II to overlook most minor surface irregularities.

Beam Break Sensing Mode Advantages

When operating in the Beam Break mode of sensing, the EDR® circuit prevents saturation. This is particularly advantageous when attempting to detect the presence of splices, overlapping materials, container contents, or adhesive labels on backing materials.

Saturation can easily occur particularly when the materials involved are translucent or transparent. Example: In label detection, if the intensity of light penetrating through the label has reached the saturation level of the sensor, the arrival of the gap between labels will not increase the signal level as displayed on the Contrast Indicator making detection of the label impossible. The new EDR® circuit built into the SMARTEYE® MARK II prevents this from occurring by compensating during the setup procedure to prevent saturation.

EDR® Benefits:

- Extends dynamic operating range to include high light level operation without reducing amplifier gain
- Eliminates saturation, important for both Beam Make or Beam Break sensing modes
- Enhances background suppression
- When operating in the proximity mode, allows use of divergent, wide beam optics to increase contrast deviation and reduce the possibility of false response to minute surface irregularities or variations in position

Features

LIGHT/DARK SWITCH

Light ON/Dark ON selector switch

OUTPUT STATUS INDICATOR

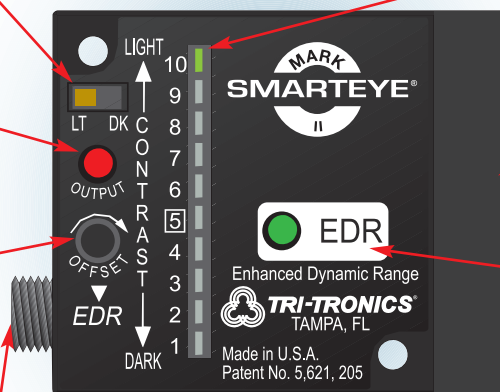
Illuminates when outputs are ON.

OFFSET ADJUSTMENT

Sets initial level in relation to switch point of 5 on CONTRAST INDICATOR- also functions as a sensitivity adjustment

CONNECTION

M12 Connector



10 LED CONTRAST INDICATOR

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

INTERCHANGEABLE OPTICAL BLOCKS

Choice of 7 Optical Blocks: O1, O1G, O2, R1, F1, V1, V1G

EDR INDICATOR

Intensity of GREEN LED provides indication of where in the dynamic operating range the offset, EDR® adjustment has been set

- FULLY LIT: Operating near saturation
- OFF: Operating near maximum sensing range

Optical Block Selection



Proximity Blocks



O1
Medium to Long Range Proximity
 Medium to Long Range Proximity



O1G
Medium to Long Range Proximity (Glass)
 Medium to Long Range Proximity



O2
Short Range Proximity
 Useful for short-range sensing.

Focused V-Axis Blocks



V1
Focused Lens V-Axis
V1G
Focused Lens V-Axis (Glass)
 Direct lens V-axis sensing at close ranges. Use for small part or precise leading edge sensing.

Retroreflective Blocks



R1
Retroreflective
 Narrow beam optics designed to sense reflectors or reflective materials.

Fiber Optic Blocks



F1
Fiber Optic Adapter
 Fiber optic quick connect

Sensing Range Guidelines

Optical Blocks	IR	RED	BLUE	WHITE
O1, O1G	6ft (1.83m)	5.5ft (1.68m)	N/A	N/A
O2	3.5in (88.9mm)	3.5in (88.9mm)	2in (50.8mm)	1.5in (38.1mm)
V1, V1G	4in (101.6mm)	4in (101.6mm)	2.25in (57.2mm)	2in (50.8mm)
R1	35ft (10.67m)	30ft (9.14m)	10ft (3.05m)	N/A
F1 (Prox)	5.5in (139.7mm)	4.5in (114.3mm)	1in (25.4mm)	0.5in (12.7mm)
F1(Prox w/lens)	1.5ft (0.46m)	14in (355.6mm)	5in (127.0mm)	2in (50.8mm)
F1Opposed	3.5ft (1.07m)	1.5ft (0.46m)	6in (152.4mm)	1.75in (44.5mm)
F1Opposed w/lens	20+ft (6+m)	20+ft (6+m)	6.5ft (1.98m)	6.5ft (1.98m)

NOTES:

- PROXIMITY tests utilized a 90% reflective target.
- RETROREFLECTIVE tests utilized a 3in diam. reflector Model AR3
- FIBER OPTIC tests utilized .125in diam. fiber bundles. Model UAC-15 Lens was used as indicated.

For more Information on useful range, see Fundamentals, Section 1.

How to Specify



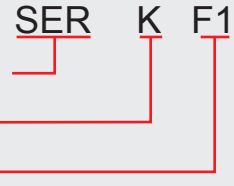
- Select sensor model based on light source required:
SEI = Infrared
SER = Red
SEB = Blue
SEWL = White
- Select adjustment type:
Blank = Potentiometer Adjust
K = Knob
- Select Optical Block based on mode of sensing required:
(see Range Guidelines).

Example:

SMARTEYE® MARK II

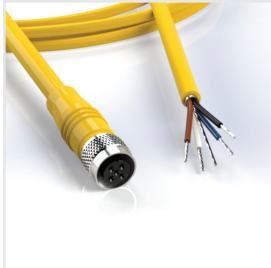
Adjustment Type

Optical Block



Hardware & Accessories

4-Wire Shielded MicroCable, M12



SEC-6
6ft (1.8m) cable

SEC-15
15ft (4.6m) cable

SEC-25
25ft (7.62m) cable



RSEC-6
6ft (1.8m) right angle connector

RSEC-15
15ft (4.6m) right angle connector

RSEC-25
25ft (7.6m) right angle connector

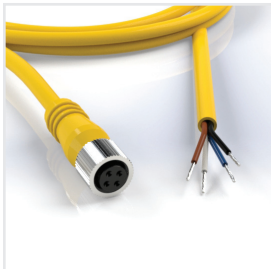
4-Wire Extension Cable, M12



BX-10
10ft (3.1m) extension cable

BX-25
25ft (7.62m) extension cable

4-Wire Unshielded Cable, M12

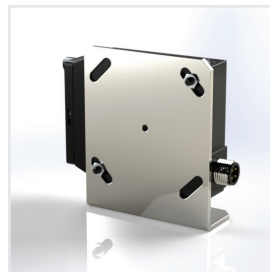


SEC-2MU
6.5ft (2.0m) cable

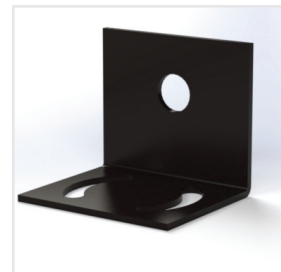
SEC-5MU
16.4ft (5.0m) cable



Mounting Brackets



SEB-1
Stainless L Bracket



FMB-1 (8.4 mm diam.)
Standard Fiber Optic



FMB-2 (5.1 mm diam.)
Mini Glass Fiber Optic



FMB-3 (3.1 mm diam.)
Mini Plastic Fiber Optic

Specifications



SUPPLY VOLTAGE

- 12 to 24VDC
- 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

HYSTERESIS

- Less than 400 millivolts for maximum sensitivity and resolution



LED LIGHT SOURCE

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

LIGHT IMMUNITY

- Responds to sensor's pulsed modulated light source
- Immune to most ambient light

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

INDICATORS

- OUTPUT INDICATOR - Red LED illuminates and the NPN or PNP outputs switch to the opposite state 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
- FULLY LIT: Operating near saturation
- OFF: Operating near maximum sensing range
- CONTRAST INDICATOR – Displays scaled reading of sensor's response to contrasting light levels (light vs. dark) on a ten bar LED display

AMBIENT TEMPERATURE

- -40°C to 70°C (-40°F to 158°F)

RUGGED CONSTRUCTION

- Chemical resistant, high impact polycarbonate 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 II SENSOR

