TRI-TRONICS®

Smart Sensing Solutions Since 1954

SMARTEYE®
MARK III

Miniature High Performance Sensor

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High Performance Sensor

The **SMARTEYE® MARK III** is a high performance sensor in a miniature size that can be used anywhere, for any task, including the toughest industrial sensing applications. Loaded with features including 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 time provides resolution of the exact position of objects traveling at high speeds. It can either be side mounted or Din rail mounted with the universal DRB-1 and is epoxy encapsulated making it rugged and vibration proof.

Features
• Response time (50 µs)
• Enhanced Dynamic Range
• 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

Light Source Guidelines

INVISIBLE INFRARED LIGHT SOURCE (880nm)

A. Best choice in most opaque object sensing tasks.

B. Provides longest possible sensing range.

C. Best choice in penetrating lens contamination.

D. Preferred for use with small glass fiber optic light guides
Note: Not recommended for plastic fiber optic light guides.

E. Best for sensing dark colored (black, blue, green, etc.) objects in the proximity mode.

F. Useful in penetrating containers for verification of contents, or detecting overlapped splices in dense materials.

RED LIGHT SOURCE (660nm)

A. Best choice for use with plastic fiber optic light guides.

B. Useful when sensing translucent objects in proximity mode.

C. Useful when sensing transparent objects in fiber optic retroreflective mode.

D. Can be polarized for retroreflective sensing to reduce proxing on shiny objects.

E. Opposed fiber optic light guides can be polarized for sensing some translucent plastic containers.

F. Used as red filter for color perception advantages.

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.

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 mode.

C. Best choice for sorting colored objects.

Features

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, for example 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

Convergent V-Axis Blocks

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

V4
Convergent 1in V-Axis
Useable range of 1in to 5in.
V4A
Convergent 1in V-Axis, Apertured
Useable range of 1in to 5in.

V6
Convergent 1.5in V-Axis
Useable range of 1.5in to 8in.

V8
Convergent .5in V-Axis
Useable range of .25in to 5in

Proximity Blocks

O4
Proximity
Wide beam optics useful for short-range sensing of a variety of objects.

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

Retroreflective Blocks

R4
Retroreflective
Narrow beam optics designed to sense reflectors or reflective materials at long range.

R5
Polarized Anti-Glare Retroreflective
Polarized to reduce response to hot-spot glare from shiny surfaces. Use with visible light source.

Fiber Optic Blocks

F4
Glass Fiber Optics
Adapter for use glass fiber optic light guides.

F5
Plastic Fiber Optics
Adapter for use plastic fiber optic light guides.

Sensing Range Guidelines

1 in = 25.4mm / 1 ft = 0.3048 meters

OPTICAL BLOCKS	IR	RED	BLUE	WHITE	OPTICAL BLOCKS	IR	RED	BLUE	WHITE	OPTICAL BLOCKS	RED	WHITE
	Convergent / Proximity / Retroreflective					**Glass Fiber Optics**					**Plastic Fiber Optics**	
V4, V4A	1in (25.4mm)	1in (25.4mm)	1in (25.4mm)	1in (25.4mm)		**Opposed Mode**					**Opposed Mode**	
V6	1.5in (38.1mm)	1.5in (38.1mm)	1.5in (38.1mm)	1.5in (38.1mm)	F4	16in (406.4mm)	1ft (0.3m)	8in (203.2mm)	5in (127.0mm)	F5	9in (228.6mm)	2in (50.8mm)
V8	0.5in (12.7mm)	0.5in (12.7mm)	0.5in (12.7mm)	0.5in (12.7mm)	F4 w/lens	20+ft (6.1m)	20+ft (6.1m)	12ft (3.6m)	9ft (2.7m)	F5 w/lens	6ft (1.8m)	2ft (0.6m)
O4	18in (457.2mm)	11in (279.4mm)	4in (101.6mm)	3in (76.2mm)						F5 w/right angle lens	3ft (0.9m)	1ft (0.3m)
O5	4ft (1.2m)	3ft (0.9m)	1.5ft (0.5m)	1ft (0.3m)		**Proximity Mode**					**Proximity Mode**	
R4	20+ft (6.1m)	18+ft (5.5m)	6ft (1.8m)	5ft (1.5m)	F4	7in (177.8mm)	5in (127.0mm)	1in (25.4mm)	1in (25.4mm)	F5	7in (177.8mm)	5in (127.0mm)
R5	N/A	7ft (2.1m)	4ft (1.2m)	3ft (0.9m)	F4 w/lens	1ft (0.3m)	1ft (0.3m)	N/A	6in (152.4mm)	F5 w/lens	1ft (0.3m)	1ft (0.3m)

Note: Proximity tests utilized a 90% reflective white target. Retroreflective tests utilized a 3in diameter round reflector, Model AR3.

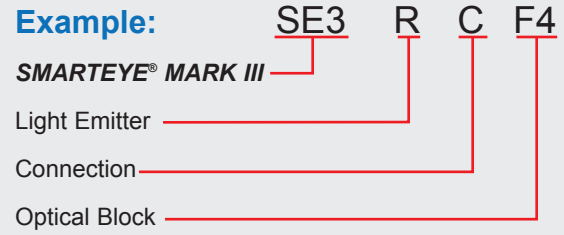*Note: Proximity tests utilized a .125in diameter fiber bundle.*

Note: Proximity tests utilized a .040in diameter fiber bundle.

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 6ft (1.8m)
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 ——
Connection ——
Optical Block ——

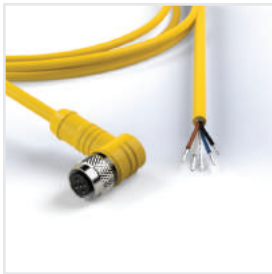# Hardware & Accessories

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

RSEC-15
15ft (4.6m) right angle
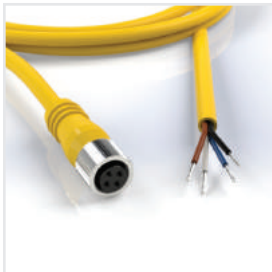
RSEC-25
25ft (7.6m) right angle

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

FMB-2 (5.1mm diam.)
Miniature Glass
Fiber Optic Mounting
Brackets

FMB-3 (3.1mm diam.)
Miniature Plastic
Fiber Optic Mounting
Brackets

TA-18
18mm Adapter

MB-18
18mm Bracket,
for use with TA-18

DRB-1
Din Rail Bracket
(included with sensor)

4-Wire Extension Cable, M12

BX-10
10ft (3.1m) extension
cable

BX-25
25ft (7.62m) extension
cable

SEB-3
Opti-Eye Stainless
Bracket
Assembly

LK-4
Lens Kit (includes F4,
F5, O4, O5, R4, R5,
V4, V4A, V6, V8 alan
wrenches and
screws)

4-Wire Unshielded Cable, M12

SEC-2MU
6.5ft (2.0m) cable

SEC-5MU
16.4ft (5.0m) cable

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

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 SENSOR

OPTICAL BLOCKS

POS — RED
BROWN*
LOAD
NPN — WHITE
(SINK) — WHITE*
150 MA MAX
12 TO 24 VDC
PNP — GREEN
(SOURCE) — BLACK*
LOAD
NEG — BLACK
BLUE*
DRAIN WIRE

*SENSORS WITH CONNECTORS

Connection Options:
Choice Of Built-In 6 Foot Shielded Cable Or M12 Connector For Use With Optional Cables

4-40 x 1/4" Or 1/2" Socket Hd. Cap Screw (3/32 Hex Key)

F4   F5
V4
V8
O5
R5
R4
V6
O4

P/N TA-18
Optional 18mm Barrel Adaptor For Through-Hole Mounting

Sensor Slides Into DRB1

P/N DRB1
Universal Mounting For DIN Rail or Site Mounting Included

Ø0.156" (4 Plcs)

2.186" (55.5mm)
0.95" (24.1mm)
0.64" (16.2mm)

3.00" w/ F4 (76.2mm)
2.85" w/ F5 (72.4mm)
2.67" w/ V4 & V8 (67.8mm)
2.56" w/ R5 (65.0mm)
2.41" w/ O5 (61.2mm)
2.35" w/ O4, R4, & V6 (59.7mm)
1.80" (45.7mm)

"C" Models Have Standard 4 Pin, M12 Connectors

0.95" (24.1mm)

Ø0.125

0.48" (12.2 mm)
1.38" (35.5mm)
0.40" (10.2 mm)
0.93" (23.6mm)

MOUNTING OPTIONS

P/N SEB-3
Optional Mounting Bracket With Hardware

2.05" (52.1mm)
1.45" (36.8mm)
1.425" (36.2mm)
0.95" (24.1mm)
0.625" (15.9 mm)
0.3125" (7.95 mm)
0.91" (23.1mm)