TRI-TRONICS®

Smart Sensing Solutions Since 1954

SMARTEYE®

High Resolution, High Speed Sensor

SMARTEYE®

The **SMARTEYE®** sensor is a unique pulse modulated sensor that has successfully performed hundreds of intricate low-contrast sensing tasks in critical material handling and automation applications.

This versatile sensor has set the standard of performance in the photoelectric sensing of size, texture, distance, opacity, depth, and color. With SMARTEYE® there is no question whether it will perform the task, because SMARTEYE® will do the job with performance to spare.

4-TURN OFFSET ADJUSTMENT

Offset vs. gain adjustment maintains sensor high resolution performance regardless of threshold position. Resolving fine differences in returned light increases stability and versatility of the sensor. A 4-turn potentiometer makes it easy to set the sensor to the right threshold setting.

CONTRAST INDICATOR

The CONTRAST INDICATOR displays a scaled reading of the level of light received by the sensor's photo detector. The more light received, the higher the reading. The less light received, the lower the reading.

Contrast is a comparison of the lightest state reading vs. the darkest state reading. The sensing task of any digital (switching) photoelectric sensor is to resolve the difference between these two light levels and switch the output accordingly. The SMARTEYE® switches its output when the light level passes the mid-scale reading of 5.

Features
- 10-LED Contrast Indicator
- 100μs response time
- High Gain
- Ambient light immunity
- Analog output (DC proportional)
- NPN or PNP output
- Infrared, Red, Green light source options

Benefits
- Easy to use
- High reliability
- Lower maintenance costs
- Reduce downtime
- Improve machine throughput

Applications
- High speed counting
- Contents inspection
- Parts presence/absence
- Printing/Marking/Coding

Models

THREE PERFORMANCE LEVELS

High Speed Models: SD, PSD
(Recommended for most sensing tasks)
Excellent resolution and high-speed response. 500µs Beam Make or Beam Break. Maximum input events per second =1000. Optimized to provide a balance between high speed of response and performance to match moderate to low-contrast applications typically found in high-speed automation.

High Gain Models: HSD, PHSD
(Recommended for low contrast applications)
Highest resolution. 1.5ms Beam Make or Beam Break. Maximum input events per second = 333. High amplification enables sensor to respond to low contrast applications found in the more difficult sensing tasks. High gain is often necessary in SMARTEYE®s used to perform product inspection or orientation sensing tasks.

Very High Speed Models: VSD, PVSD
(Recommended only when high-speed sensing is critical)
Good resolution and high-speed response. 100µs Beam Make or Beam Break. Maximum input events per second = 5000. Optimized to provide high speed response while maintaining the necessary performance levels required in high velocity/high speed sensing.

LIGHT SOURCE SELECTION

Infrared Light Source
Invisible light – recommended in opaque object sensing applications. Infrared LED light source provides long-range sensing in either Beam Make or Beam Break modes. Infrared light maximizes the sensor's ability to penetrate contamination found in harsh environments.

High Intensity Infrared Light Source
Invisible light for maximum possible range in either Beam Make or Beam Break sensing modes. Provides maximum penetration for use in harsh environments. Also works well with the small diameter fiber optic light guides.
NOTE: Not recommended for use in close-up sensing or for use in most low contrast applications.
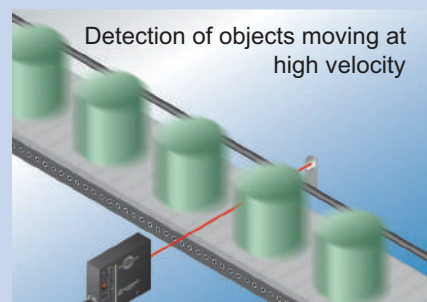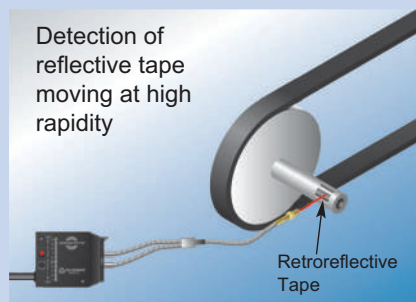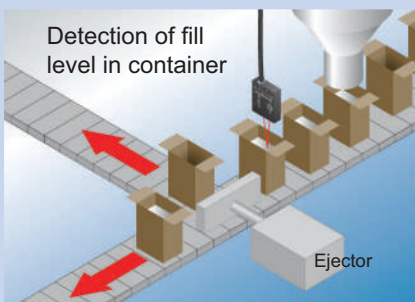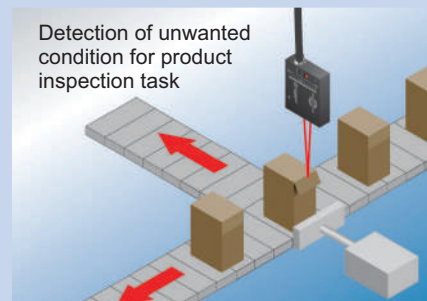
Red (Visible) Light Source
Recommended for sensing transparent/translucent objects. Out performs infrared light in many moderate to low contrast applications. Also recommended for use with plastic fiber optic light guides.

Green (Visible) Light Source
Recommended for use only in applications where the color green provides an obvious advantage. Example: sensing a light colored red/pink object on a white background. Also has been used in film processing applications when red or infrared light can cause damage to sensitive film.

Typical Applications

Detection of very small objects

Polarized light detection of plastic containers

Detection of unwanted condition for product inspection task

Detection of fill level in container

Ejector

Detection of reflective tape moving at high rapidity

Retroreflective Tape

Detection of objects moving at high velocity

Optical Block Selection

SMARTEYE®
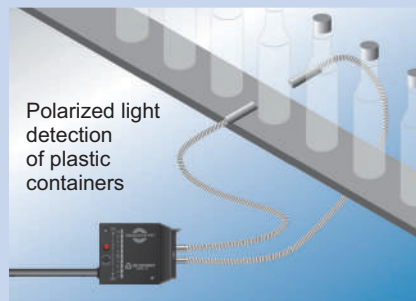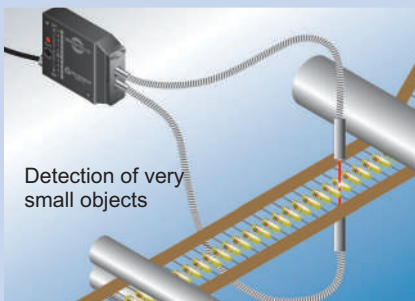
Proximity Blocks

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

1 in = 25.4mm / 1ft = 0.3048 meters

High Gain	LED	Speed	O1, O1G	O2	V1, V1G	R1	F1 (Prox)	F1 (Prox w/lens)	F1 Opposed	F1 Opposed w/lens
HSDL / PHSDL	high IR	1.5ms	6ft (1.8m)	7in (177.8mm)	7in (177.8mm)	35ft (10.7m)	6.5in (165.1mm)	N/A	66in (1.7m)	20+ft (6.1m)
SDL / PSDL	infrared	1.5ms	4ft (1.2m)	5.5in (139.7mm)	4.5in (114.3mm)	30ft (9.1m)	5in (127.0mm)	10in (254mm)	48in (1.2m)	20+ft (6.1m)
SDLR / PSDLR	red	1.5ms	2.5ft (0.7m)	2.25in (57.1mm)	3in (76.2mm)	30ft (9.1m)	4.5in (114.3mm)	9in (228.6mm)	12in (304.8mm)	13.5ft (4.1m)
SDLG / PSDLG	green	1.5ms	N/A	N/A	.75in (19mm)	N/A	.25in (6.4mm)	N/A	2.75in (69.9mm)	3ft (0.9m)
High Speed										
HSD / PHSD	high IR	500µs	5ft (1.5m)	5.5in (139.7mm)	4.75in (120.6mm)	32ft (9.8m)	5.5in (139.7mm)	10in (254.0mm)	54in (1.4m)	20+ft (6.1m)
SD / PSD	infrared	500µs	3ft (9.1m)	4.5in (114.3mm)	3in (76.2mm)	20ft (6.1m)	3.5in (88.9mm)	7in (177.8mm)	32in (0.8m)	16ft (4.9m)
SDR / PSDR	red	500µs	1.5ft (0.4m)	1.75in (19.0mm)	2.25in (57.1mm)	12ft (3.6m)	3in (76.2mm)	10in (254.0mm)	6in (152.4mm)	11ft (3.3m)
Very High Speed										
VSD / PVSD	infrared	100µs	2ft (0.6m)	3in (76.2mm)	2.5in (63.5mm)	16ft (4.9m)	2in (50.8mm)	6in (152.4mm)	28in (0.7m)	14ft (4.3m)
Analog										
SAL	infrared	1.5ms	4ft (1.2m)	5.5in (139.7mm)			5in (127.0mm)	10in (254.0mm)	48in (1.2m)	20ft (6.1m)
SALR	red	1.5ms	2.5ft (0.8m)	2.25in (57.15mm)			4.5in (114.3mm)	9in (228.6mm)	12in (304.8mm)	13ft (4.0m)
SA	infrared	500µs	3ft (0.9m)	4.5in (114.3mm)			3.5in (88.9mm)	7in (177.8mm)	32in (0.8m)	16 ft (4.9m)
SAR	red	500µs	1.5ft (0.4m)	1.75in (44.45mm)			3in (76.2mm)	10in (254.0mm)	6in (152.4mm)	11ft (3.4m)
HSAQ	high IR	near linear	1ft (0.3m)	12in (304.8mm)			1in (25.4mm)	3.5in (88.9mm)	N/A	N/A
SAQ	high IR	near linear	N/A	N/A			N/A	N/A	N/A	1ft (0.3m)

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

How to Specify

1. Select Sensor Model based on LED light source and output required

NPN Output

HSDL	High Gain, High Intensity IR
HSD	High Speed, High Intensity IR
SDL	High Gain IR
SD	High Speed IR
VSD	Very High Speed IR
SDLR	High Gain Red
SDR	High Speed Red
SDLG	High Gain Green

PNP Output

PHSDL	High Gain, High Intensity IR
PHSD	High Speed, High Intensity IR

PSDL	High Gain IR
PSD	High Speed IR
PVSD	Very High Speed IR
PSDLR	High Gain Red
PSDR	High Speed Red
PSDLG	High Gain Green

Analog Output

SAL	High Gain IR
SA	High Speed IR
SALR	High Gain Red
SAR	High Speed Red
HSAQ	Near Linear High Intensity IR
SAQ	Near Linear High Intensity IR

Example: SD   F1

SMARTEYE® ————

Optical Block ————

2. Select Optical Block based on mode of operation required
F1 = Fiber optic
O1, O1G = Medium to Long Range Proximity
O2 = Short Range proximity
V1, V1G = Focused V-Axis Lens (not available on Analog Sensors)
R1 = Retroreflective (not available on Analog Sensors)

Features

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
6ft (1.85m) 4-wire cable

10 LED CONTRAST INDICATOR
Provides at-a-glance analysis of the sensor's response to Light State vs Dark State sensing conditions.
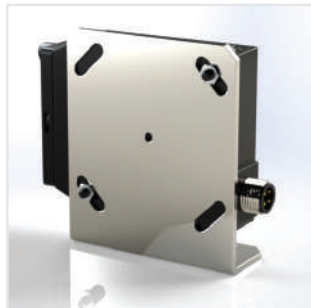
INTERCHANGEABLE OPTICAL BLOCKS
Choice of 7 Optical Blocks - O1, O1G, O2, R1, F1, V1, V1G

Hardware & Accessories
Mounting Brackets

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

SEB-1
Stainless L Bracket

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

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

Specifications

SMARTEYE®

General Application Photoelectric Sensors

2

SUPPLY VOLTAGE
- 12 to 24VDC
- Polarity protected

CURRENT REQUIREMENTS
- 75mA (exclusive of load)

OUTPUTS
Digital (Switching)
- Models with complementary NPN output transistors sink up to 100mA @ 40VDC max
- Models with complementary PNP output transistors source up to 100mA @ 40VDC max
- Zener protected against voltage spikes

Analog (DC Proportional)
- Output swings from 0 up to 3 volts less than supply voltage with RL greater than 10K ohms
- Models SAQ and HSAQ approximates near linear output

HYSTERESIS
- 400 millivolts for maximum sensitivity and resolution

LED LIGHT SOURCE WAVELENGTH
A. Infrared = 880nm
B. Red = 660nm
C. Green = 550nm

RESPONSE TIME
- Minimum duration of input event – Beam Make or Beam Break
- High Speed Models = 500 microseconds, 1000 input events per second
- High Gain Models = 1.5 milliseconds, 333 input events per second
- Very High Speed Models = 100 microseconds, 5000 input events per second
- Analog Models = Speed of response represents rise time output from 10% to 90% of voltage swing

LIGHT IMMUNITY
- Pulse modulated to provide extremely high immunity to ambient light— including sunlight

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

RUGGED CONSTRUCTION
- Chemical resistant, high impact poly carbonate housing
- Epoxy encapsulated for mechanical stability
- Waterproof, ratings: NEMA 4X, 6P and IP67

ADJUSTMENTS AND INDICATORS
- OFFSET – Sets initial level in relation to switch point of 5 on CONTRAST INDICATOR– also functions as a sensitivity adjustment
- OUTPUT INDICATOR – LED illuminates and output switches when returned light level exceeds 5 on CONTRAST INDICATOR
- CONTRAST INDICATOR – Displays scaled reading of contrasting light levels (light vs. dark) on a 10-bar LED display
- ANALOG MODELS – Gain sets amplification level to light /dark differential

RoHS Compliant
Product subject to change without notice

Connections and Dimensions

SMARTEYE® SENSOR

RED
Positive 12 to 24 VDC

WHITE
Dark "On"

GREEN *
Light "On"

BLACK
Negative

SHIELD
Ground

6 ft., 4 Wire Shielded Cable (182.9 cm)

6-32 x 1/4" socket hd. cap screw (7/64 hex key)

Mounting Holes 0.20 Dia

* FOR ANALOG MODELS:
WHITE - Output
GREEN - Not Used

3.50" with R1 (88.9 mm)
3.25" with 01 (82.5 mm)
3.00" w/02, F1, V1 (76.2 mm)
2.00" (50.8 mm)

2.00" (50.8 mm)
0.54" (13.8 mm)
1/2" - 14 NPT Threads

2.50" (63.5 mm)
0.20 Dia (5.0 mm)

0.75" (19.1 mm)
2.50" (63.5 mm)
1.59" (40.4 mm)

O1
O1G

V1
V1G

R1

F1

O2

OPTICAL BLOCKS

2.75" (69.8 mm)
2.00" (50.8 mm)
3.19" (80.9 mm)
2.00" (50.8 mm)
(25.4 mm)
1.00"
0.44" (11.1 mm)
1.75" (44.5 mm)

OPTIONAL MOUNTING BRACKET
P/N SEB-1 WITH HARDWARE