High Resolution
High Speed

SMARTEYE®

CLASSIC

SMARTEYE® CLASSIC *High Resolution, High Speed*

Since introducing the SMARTEYE® line, these unique pulse modulated Photoelectric Sensors have successfully performed hundreds of intricate "low contrast" sensing tasks in critical material handling and automation applications— including product inspection tasks where even $5,000 and $10,000 vision systems couldn't do the job!

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

High-speed response, high sensitivity, and long-range capabilities, combined with the unique CONTRAST INDICATOR™ give you a sensor that you can depend on—a sensor that eliminates marginal performance—and all at an affordable price!

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 midscale reading of "5".

Fiberoptic Light Guides

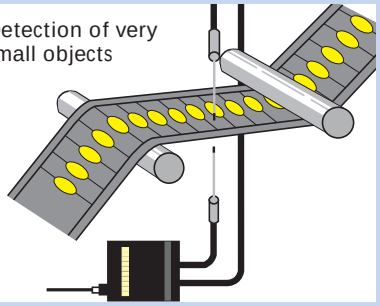
Flexible fiberoptic light guides are available in sizes small enough to fit into your toughest job sensing sites, in models for inaccessible places and detection of extremely small parts, for high temperature applications, corrosive environments, or high-vibration locations, as well as straight light guides for Beam Break and bifurcated light guides for proximity sensing.

Features

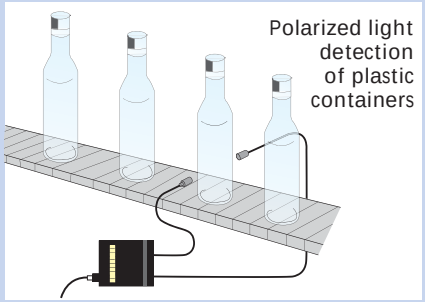
- Unique CONTRAST INDICATOR™ allows easy setup for optimum performance and displays actual performance during operation
- High-speed models: 500 microseconds Beam Make or Beam Break. Excellent resolution and high-speed response. Recommended for most sensing tasks
- High-gain models: 1.5 milliseconds Beam Make or Beam Break. Highest resolution. Recommended for "very low"contrast tasks
- Very high-speed models. 100 microseconds Beam Make or Beam Break. Good resolution with very high-speed response. Recommended for use when speed of response is critical
- Pulse-modulated for high immunity to ambient light
- Unique interchangeable optical block design
- Digital (switching) NPN or PNP output transistor models available
- Analog (DC proportional) output models available
- Light source selection: infrared, high intensity, red, (vis-

Typical Applications

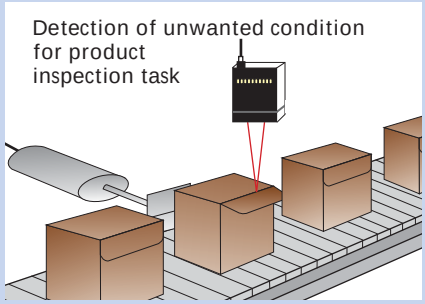
Detection of very small objects



Polarized light detection of plastic containers



Detection of unwanted condition for product inspection task



SMARTEYE® CLASSIC *High Resolution, High Speed*

Switching Models NPN (Digital)	Switching Models PNP	DC Proportional Models (Analog)	Performance	Light Source
SD	PSD	SA	High Speed, 500 µs	Infrared
SDL	PSDL	SAL	High Gain, 1.5 ms	Infrared
VSD	PVSD	-	Very High Speed, 100 µs	Infrared
SDR	PSDR	SAR	High Speed, 500 µs	Red
SDLR	PSDLR	SALR	High Gain, 1.5 ms	Red
SDLG	PSDLG	-	High Gain, 1.5 ms	Green
HSD	PHSD	-	High Speed, 500 µs	High Intensity IR
HSDL	PHSDL	-	High Gain, 1.5 ms	High Intensity IR
-	-	SAQ	Near Linear Output/Opposed Mode	Infrared
-	-	HSAQ	Near Linear Output/Proximity Mode	High Intensity IR

NOTE: NPN models shown. To order PNP Current Sourcing outputs, add prefix "P" to model number.

PERFORMANCE

High Speed Models: SD, PSD

(recommended for most sensing tasks)

Excellent resolution and high-speed response. 500 µs 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 very low contrast applications)

Highest resolution. 1.5 ms Beam Make or Beam Break. Maximum input events per second = 333. High amplification enables sensor to respond to very 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 very high-speed response. 100 µs Beam Make or Beam Break. Maximum input events per second = 5000. Optimized to provide very 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 fiberoptic light guides. NOTE: Not recommended for use in close-up sensing or for use in most low contrast applications.

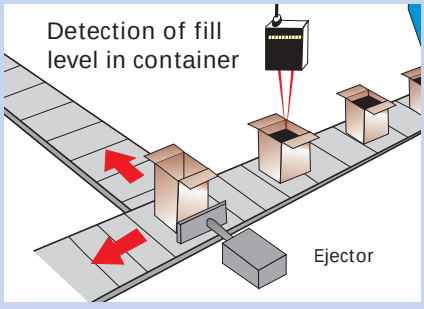
Red (Visible) Light Source

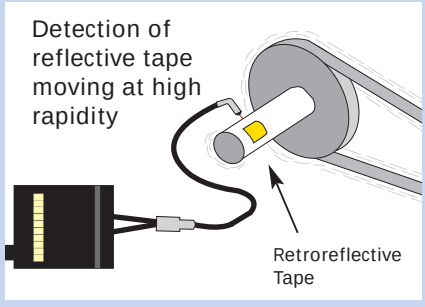
Visible red LED light source recommended for sensing transparent/translucent objects. Outperforms infrared light in many moderate to low contrast applications. Also recommended for use with plastic fiberoptic light guides.

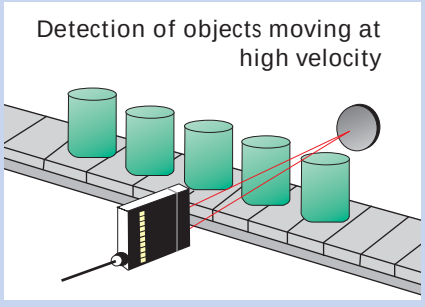
Green (Visible) Light Source

Recommended for use only in applications where the color green provides an obvious advantage. An example would be 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





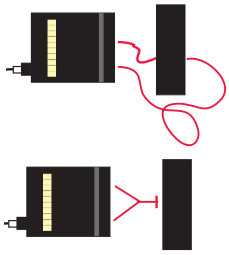


Optical Block Selection

Interchangeable optical blocks provide for universal application of the SMARTEYE® CLASSIC to any sensing task from large object sensing to finite sensing of small parts. Plastic lenses standard. Glass lenses available. Consult factory.

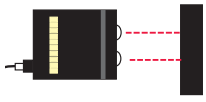
Type F1
Fiberoptic Adapter

Type F1 adapts SMARTEYE® CLASSIC to any standard fiberoptic light guide with .187" O.D. tips. The light guide is inserted and held in place with set screws. See Fiberoptic Light Guides Section for selection.



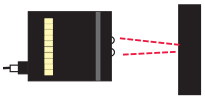
Type O1, O1G
(Glass) Medium to Long Range Proximity

Type O1, O1G (Glass) adapts the SMARTEYE® CLASSIC to the optical proximity mode of sensing. Range is dependent on size, shape, surface reflectivity of the object to be detected.



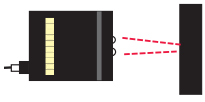
Type O2
Short Range Proximity

Type O2 also adapts the SMARTEYE® CLASSIC to the optical proximity mode of sensing, but on a sharp "V" axis to control depth of view. Range is dependent on model of The SMARTEYE® CLASSIC selected.



Type V1, V1G
(Glass) Focused Lens "V" Axis

Type V1, V1G (Glass) is for direct lens "V" axis sensing at close ranges. Used for small part or precise leading edge sensing. Range is dependent on model of the SMARTEYE® CLASSIC selected.



Type R1
Retroreflective

Type R1 turns the SMARTEYE® CLASSIC into a retroreflective sensor. Range is dependent on model the SMARTEYE® CLASSIC selected and size of reflectors.

Sensing Range Guidelines

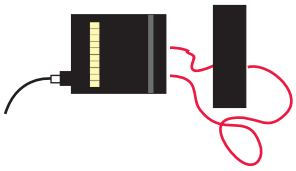
SMARTEYE® CLASSIC DIGITAL (SWITCHING) MODELS

Optical Blocks	SD	SDL	VSD	SDR	SDLR	SDLG	HSD	HSDL
O1, O1G	3 ft.	4 ft.	2 ft.	1 1/2 ft.	2 1/2 ft.	N/A	5 ft.	6 ft.
O2	4 1/2 in.	5 1/2 in.	3 in.	1 3/4 in.	2 1/4 in.	N/A	5 1/2 in.	7 in.
V1, V1G	3 in.	4 1/2 in.	2 1/2 in.	2 1/4 in.	3 in.	3/4 in.	4 3/4 in.	7 in.
R1	20 ft.	30 ft.	16 ft.	12 ft.	30 ft.	N/A	32 ft.	35 ft.
F1 (Prox)	3 1/2 in.	5 in.	2 in.	3 in.	4 1/2 in.	1/4 in.	5 1/2 in.	6 1/2 in.
F1 (Prox w/lens)	7 in.	10 in.	6 in.	10 in.	9 in.	N/A	10 in.	NOT RECOMMENDED
F1 Opposed	32 in.	48 in.	28 in.	6 in.	12 in.	2 3/4 in.	54 in.	66 in.
F1 Opposed w/lens	16 ft.	20 ft. +	14 ft.	11 ft.	13 1/2 ft.	3 ft.	20 ft. +	20 ft. +

NOTES:
- For more Information on useful range, see Fundamentals, Section 1.
- PROXIMITY tests utilized a 90% reflective target.
- RETROREFLECTIVE tests utilized a 3 In. diam. reflector Model AR3
- FIBEROPTIC tests utilized .125 in. diam. fiber bundles. Model UAC-15 Lens was used as indicated.

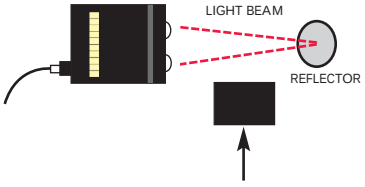
Preferred Mode: Beam Break

Option 1



Fiberoptic opposed mode is best choice for detecting any opaque object.
Sensor: Model SDF1(IR Light Source)
Fiberoptic Light Guides: (2) Model F-A-36T
Sensing Range: Up to 3.2 in.
Accessories: (2) Model UAC-15 lenses, extends sensing range up to 15 ft.
Mounting bracket, Model SEB-1, FMB-1
NOTE: Select smaller fiber bundle for small part detection. (See Fiberoptic Section)

Option 2

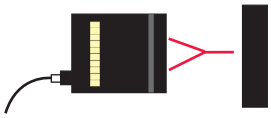


Retroreflective mode. Use with reflector to detect medium to large size opaque objects.
Sensor: Model SDRR1 (Red Light Source)
Reflector: Model 78P, Plastic, 4.4 in. X 1.9 in. screw mounted. (See Accessories Section for complete listing of reflectors)
Sensing Range: Up to 20 ft.
Accessories: Mounting bracket, Model SEB-1
NOTE: Not recommended for detecting highly reflective objects.

Alternate Mode: Beam Make (Proximity)

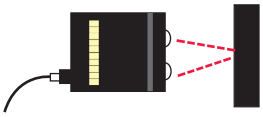
NOTE: Consider proximity mode when installation sensing site conditions preclude using the preferred Beam Break mode.

Option 1



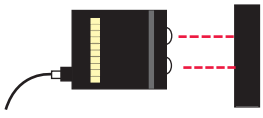
Fiberoptic proximity is used to detect medium to large flat sided opaque objects.
Sensor: Model SDF1 (IR Light Source)
Fiberoptic Light Guides: Model BF-A-36T
Sensing Range: Up to 3.5 in.
Accessories: (1) Model UAC-15 lens. Use to extend sensing range up to 7 in.
Mounting bracket, Model SEB-1, FMB-1
NOTE: Select smaller fiber bundle for small part detection. (See Fiberoptic Section)

Option 2



Convergent/proximity mode is useful to detect opaque objects when there is little (if any) gap between objects.
Sensor: Model SDV1 (IR Light Source)
Sensing Range: From 1/2 to 3 in.
Accessories: Mounting bracket, Model SEB-1

Option 3



Proximity (divergent beam) mode sensing is useful in detecting some large size opaque objects from longer range. Generally speaking, there must be substantial gaps between objects for this mode to be effective.
Sensor: Model SD01 (IR Light Source)
Sensing Range: From 1/2 to 3 ft.
Accessories: Mounting bracket, Model SEB-1

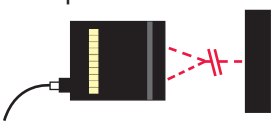
Preferred Mode: Retroreflective Beam Break

NOTE: The *Preferred Sensor* is the SMARTEYE® EZ-PRO Model EZPRF1, EZPBF1 or EZPRCF4 with a BF-A-36T fiber and a 78P reflector. (Refer to SMARTEYE® EZ-PRO Selection Guidelines, for details)

Alternate Mode: Beam Make (Proximity)

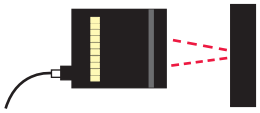
NOTE: Consider proximity mode when translucent/transparent objects/containers are filled with clear liquid or when site conditions preclude using the preferred retroreflective Beam Break mode.

Option 1.



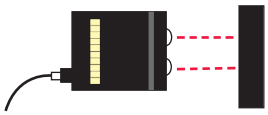
Fiberoptic proximity mode is useful to detect transparent/translucent objects.
Sensor: Model SDLRF1 (Red Light Source)
Fiberoptic Light Guides: Model BF-A-36T
Sensing Range: Up to 4.5 in.
Accessories: (1) Model UAC-15 lens. Use to extend sensing range up to 9 in.
Mounting bracket, Model SEB-1, FMB-1
NOTE: Select smaller fiber bundle for small part detection. (See Fiberoptic Section)

Option 2.



Convergent/proximity mode is useful to detect most transparent/translucent objects when there is little (if any) gap between objects.
Sensor: Model SDLV1 (Red Light Source)
Sensing Range: From 1/2 in. to 3 in.
Accessories: Mounting bracket, Model SEB-1

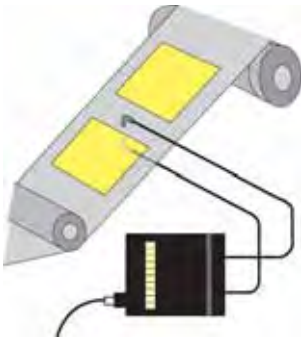
Option 3.



Proximity (divergent beam) mode sensing is useful in detecting some large size translucent/transparent objects from longer range. Generally speaking, there must be substantial gaps between objects for this mode to be effective.
Sensor: Model SDLR01 (Red Light Source)
Sensing Range: From 1/2 in. to 2.5 ft.
Accessories: Mounting bracket, Model SEB-1

LABEL SENSING:

Alternate Mode:



Alternate Mode: Fiberoptic Opacity (Thru-Beam)

Best method to detect self-adhesive labels on backing material.
Sensor: Model SDF1 (IR Light Source)
Fiberoptic Light Guides: (2) Model F-A-36T
Sensing Range: From 1/2 in. to 2 in.
Accessories: Mounting bracket, Model SEB-1, FMB-1
NOTE: It is not necessary to use smaller fibers for this application. However, many optional sensing tip configurations are available that may provide an improved mechanical fit for your sensing site conditions.

See LABEL•EYE® for preferred method of sensing.

How to Specify

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

Example: SD FI

SMARTEYE® CLASSIC — Fiberoptic Optical Block

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

PNP Output

PHSDL	High Gain, High Intensiity 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

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

2. Select Optical Block based on mode of operation required

   F 1 = Fiberoptic

   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)

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

SEB-1
Stainless “L” Bracket

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

Specifications

SUPPLY VOLTAGE
- 12 to 24 VDC
- Polarity protected

CURRENT REQUIREMENTS
- 75 mA (exclusive of load)

OUTPUTS
Digital (Switching)
- Models with complementary NPN output transistors sink up to 100 mA @ 40 VDC max
- Models with complementary PNP output transistors source up to 100 mA @ 40 VDC 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 = 880 nm
B. Red = 660 nm
C. Green = 550 nm

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

Product subject to change without notice.
Consult Factory for RoHS Compliance.

Connections and Dimensions SMARTEYE® CLASSIC