General Application Photoelectric Sensors

SMARTEYE® CLASSIC

General Purpose Photoelectric Sensor

SMARTEYE® CLASSIC
Since introducing the SMARTYE® 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 SMARTYE® has set the “standard of performance” in the photoelectric sensing of size, texture, distance, opacity, depth and even color. With SMARTYE®, there is no question whether it will perform the task, because SMARTYE® 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 SMARTYE® 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 the toughest job sensing sites. There are many models available for inaccessible areas such as extremely tight mechanical pockets, high temperature applications, corrosive or caustic environments, or high vibration mounting considerations. There are many varieties of tip configurations available for either straight or bifurcated fiberoptic requirements.

Features
- 10-LED Contrast Indicator
- 100 microseconds 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
Features

PERFORMANCE
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 very 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 very low contrast applications found in the more difficult sensing tasks. High gain is often necessary in SMARTYE®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. 100µs 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

Detection of very small objects
Detection of fill level in container
Detection of unwanted condition for product inspection task
Detection of reflective tape moving at high rapidity
Detection of objects moving at high velocity
Polarized light detection of plastic containers
Retroreflective Tape

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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.
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.

### Sensing Range Guidelines

**SMARTEYE® CLASSIC DIGITAL (SWITCHING) MODELS**

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

**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.
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
- PSDLR: 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

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)
Specifications

**SUPPLY VOLTAGE**
- 12 to 24 VDC
- Polarity protected

**CURRENT REQUIREMENTS**
- 75mA (exclusive of load)

**OUTPUTS**

**Digital (Switching)**
- Models with complementary NPN output transistors sink up to 100mA @ 40 VDC max
- Models with complementary PNP output transistors source up to 100mA @ 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**
- Infrared = 880nm
- Red = 660nm
- 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

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Connections and Dimensions

<table>
<thead>
<tr>
<th>RED</th>
<th>Positive 12 to 24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>Dark &quot;On&quot;</td>
</tr>
<tr>
<td>GREEN</td>
<td>Light &quot;On&quot;</td>
</tr>
<tr>
<td>BLACK</td>
<td>Negative</td>
</tr>
<tr>
<td>SHIELD</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

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**SMARTEYE® CLASSIC PHOTOELECTRIC SENSOR**

**Mounting Holes 0.20 Dia**

**6 ft. 4 Wire Shielded Cable**

**R1**

**V1**

**V1G**

**O1**

**O1G**

**OPTICAL BLOCKS**

**OPTIONAL MOUNTING BRACKET**

P/N SEB-1 WITH HARDWARE

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RoHS Compliant

Product subject to change without notice