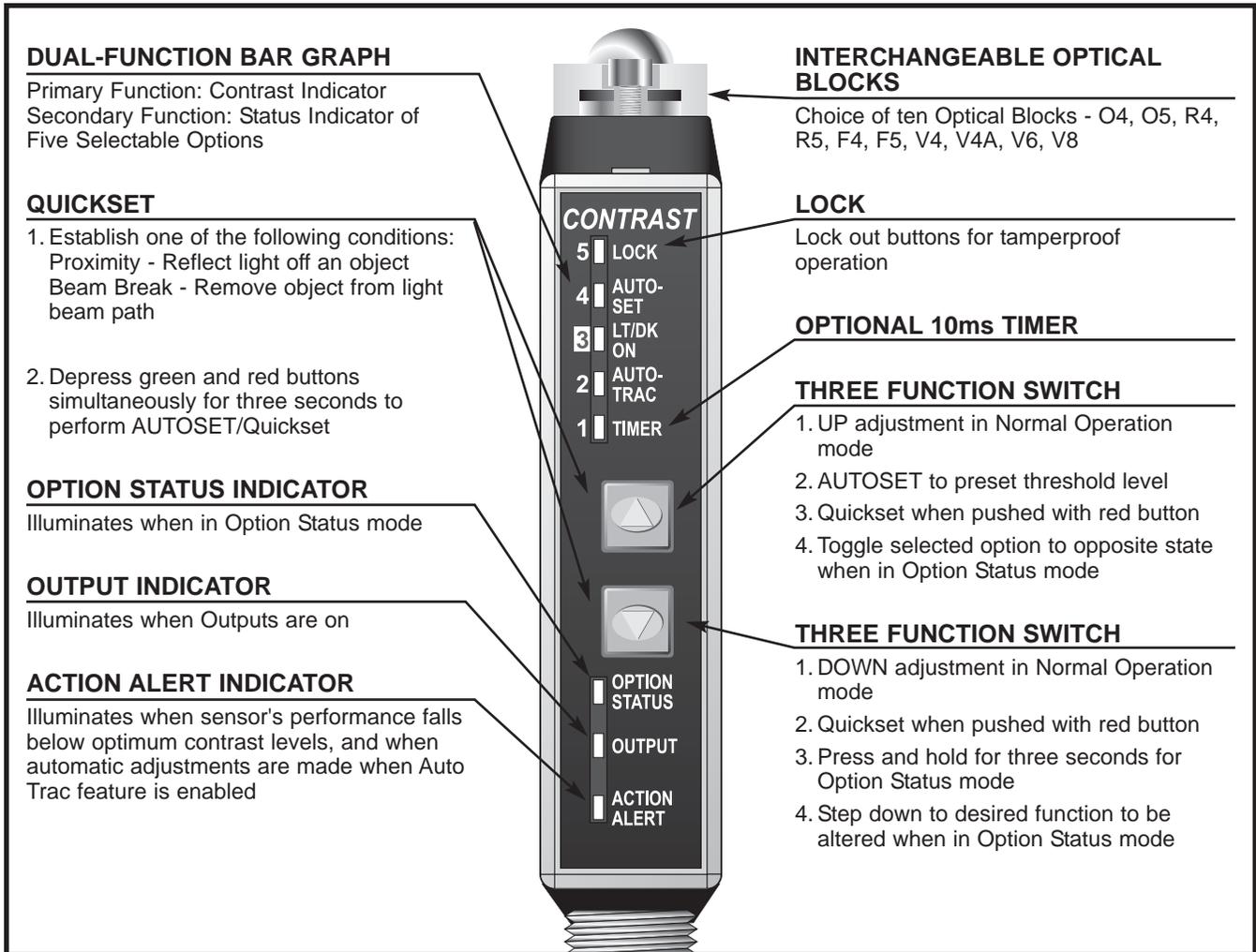


Set-up and Operation Instructions



The **SMART EYE[®] PRO** is not a teach mode sensor; it is an automatic sensor. It is a high performance photoelectric sensor that, after the initial setup, can be adjusted by a single push of a button. As a result, there is no guesswork on the part of the operator. Now you can throw away the screwdriver.

After selecting the features of your application requirements, the **SMART EYE[®] PRO** sensor is ready to be adjusted. Simply put the target in front of the sensor (proximity mode) and push the green AUTOSET button. From that point on, the sensor will automatically maintain a perfect setting, thanks to the dynamic ACT (Automatic Contrast Tracking) system. The **SMART EYE[®] PRO** sensors are also equipped with a 5- LED Contrast Indicator as well as an Action Alert diagnostic tool that allows the operator to visually substantiate performance.

The Smarteye Pro sensors have the ability to perform a Light State AUTOSET as well as a Dark State AUTOSET (selectable in Option Status Mode). Dark State AUTOSET is useful for maximum range applications, or when the background is shiny or reflective.

The Lock feature ensures the **SMART EYE[®] PRO** sensor is tamperproof. When the Lock feature is enabled in Options Status mode, the sensor's buttons will not allow an AUTOSET to be performed. This feature provides assurance of hassle-free operation operators have come to expect from a **SMART EYE[®]**.

QUICKSET ... GUIDELINES TO EASY ADJUSTMENT

STATIC QUICKSET

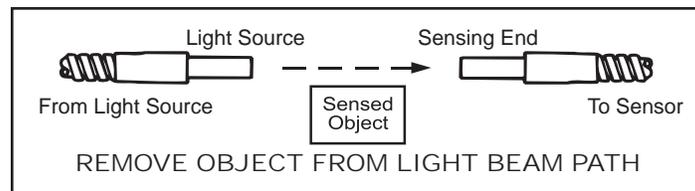
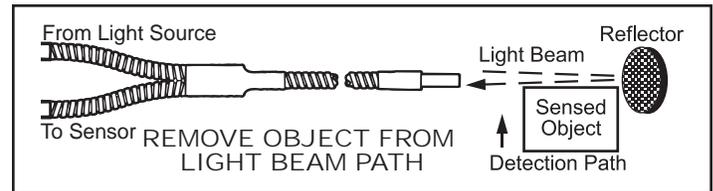
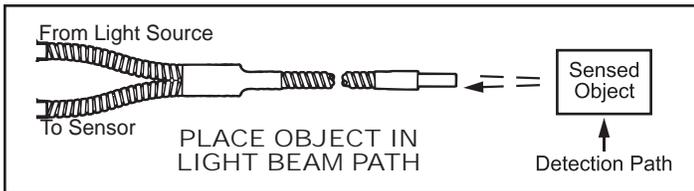
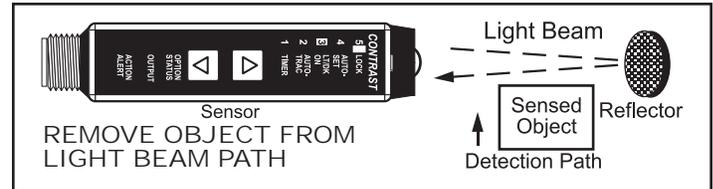
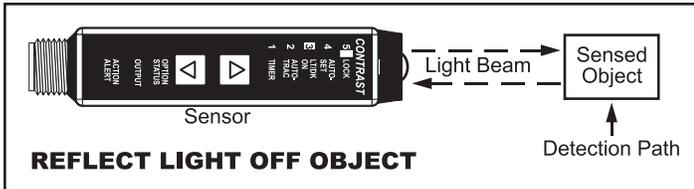
This two step procedure is easy to perform and requires no expertise whatsoever.

1. Establish one of the following conditions:

Proximity Mode ... Reflect light off object.

Beam Break Mode ... Remove object from light beam path.

2. Depress the red and green buttons simultaneously for 3 seconds.



Upon a Quickset command, the sensor ensures the lock feature is off and then automatically adjusts itself to “5” on the contrast indicator.

DYNAMIC QUICKSET

Depressing both green and red buttons for 3 seconds while input events are on-going will often times result in a perfect setting thanks to the Automatic Contrast Tracking system (ACT). If, after attempting a dynamic quickset routine a couple of times without producing a satisfactory adjustment, it is recommended that you initiate a series of “up” or “down” manual commands while viewing the contrast indicator. When the signal level reaches the threshold of 3 on the indicator, the ACT digital tracking system will automatically complete the adjustment.

MANUAL-ADJUST

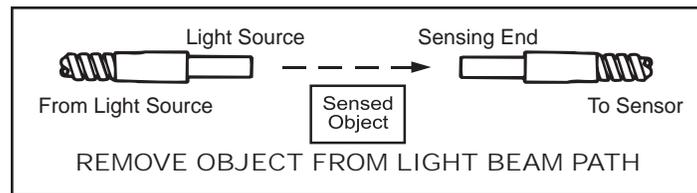
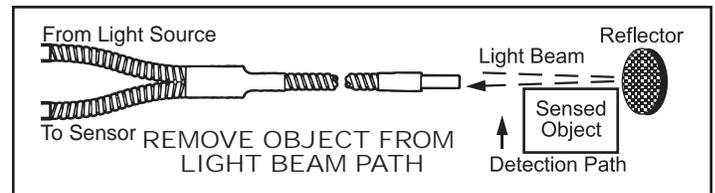
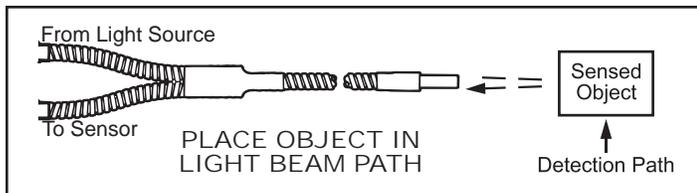
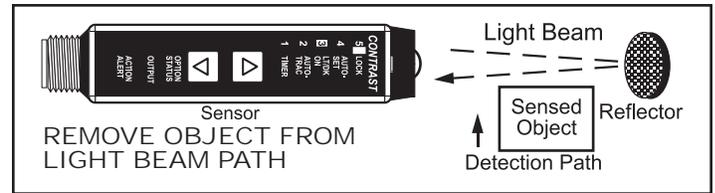
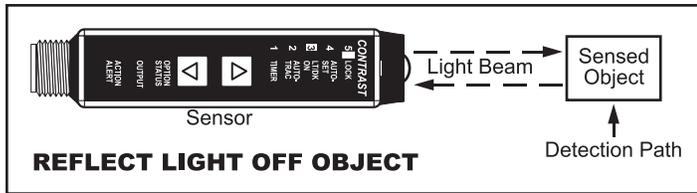
Please note that the green “up” button, or the red “down” button are functional at all times, as long as the lock feature is disabled. Tap the green button to move the adjustment (as indicated on the contrast indicator) toward the light state. Tap the red button to move the adjustment toward the dark state. Tapping the manual buttons advances the adjustment in small, incremental steps of about 1/2 bar per step as displayed on the contrast indicator. Manual adjustments are particularly useful for product inspection tasks, or when finite adjustments are required for very low contrast applications.

STATIC AUTOSET FUNCTION

When operating in the normal mode, (with the option status LED “off”), simply push the green button for 3 seconds to present the sensor to a “light” state level of 5 on the contrast indicator. The sensor must be in the “light” state sensing condition before depressing the button. If the “dark” state AUTOSET has been selected, put the sensor in the dark state and depress and hold the green button for 3 seconds. The sensor will preset itself to a dark state level of 1. **NOTE: Only one push of the green button is required.** On rare occasions, when the AUTOSET feature does not result in a desirable setting, manual adjustments are simple and easy to perform while viewing the contrast indicator (see Manual-Adjust above).

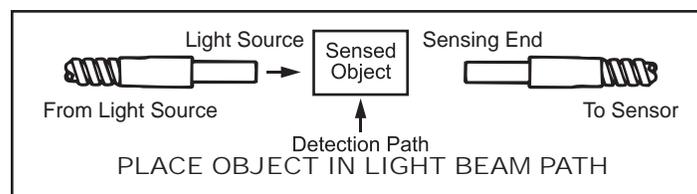
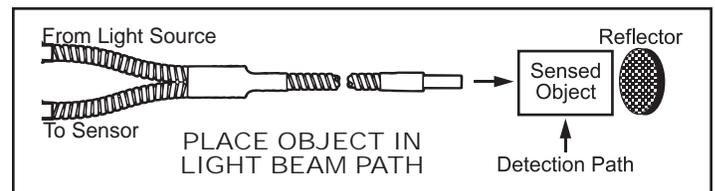
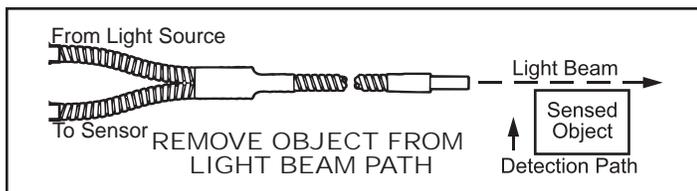
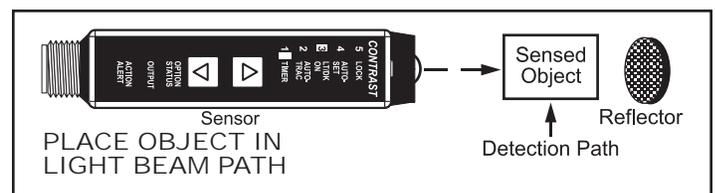
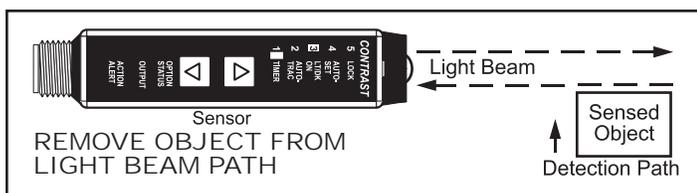
LIGHT STATE AUTO-SET

Preferred set-up routine when detecting transparent or opaque objects in the beam break sensing modes (through-beam/retroreflective). Also recommended for use in the proximity mode (beam make) when it's required to suppress light reflecting off background objects. **Note:** When detecting objects moving at high speed or velocity, a **light state** static AUTOSET command is best whenever the light-to-dark input duty cycle substantially favors the **light state**.



DARK STATE AUTO-SET

Preferred set-up routine results in **maximum** sensing range in all sensing modes. **Note:** When detecting objects moving at high speed or velocity, a **dark state** AUTOSET command is best whenever the light-to-dark input duty cycle substantially favors the **dark state**.



DISPLAY STATUS OF SELECTABLE OPTIONS

Press and hold red button for 3 seconds. Immediately, the 5-LED bargraph will go into a flashing routine. When completed, the 5 LED bargraph will switch from functioning as a contrast indicator to a status indicator. Now the status of the 5 selectable functions will be displayed and the amber LED option status indicator will be lit.

SELECT FUNCTION TO BE ALTERED

Step to the desired function to be toggled to the opposite state by “tapping” the red button. The first “tap” will step to the “lock” select function. To indicate the “lock” function has been selected, the #5 LED will blink. The next “tap” will step the blinking of the indicator to the #4 LED. Another “tap” of the red button will step the blinking of the indicator to the #3 LED. Another “tap” to the #2 LED and, finally, the fifth “tap” will select the #1 LED. Along the way, if you have chosen to toggle a function to the opposite state, press the green button to enter your choice into memory and switch the sensor to normal operation. **This sequence must be repeated for each function to be altered.** If you do not desire to change the status of any of the control functions, tap the red button a sixth time or wait 5 seconds and allow the sensor to automatically return to normal operation.

5 SELECTABLE OPTIONS

When the “option status” amber LED indicator is lit, the 5 LED bargraph is indicating the following:

#5 LED “on” ... The “lock” feature is **enabled**. Result: When in normal operating mode, the manual up/down and AUTOSET adjustments are **disabled**. **LED “off”** ... Manual adjustments are **enabled**.

#4 LED “on” ... AUTOSET will be to a “light state” set point. **LED “off”** ... AUTOSET will be to a “dark state” set point (see AUTOSET instructions).

#3 LED “on” ... Light “on” output selected. **LED “off”** ... Dark “on” output selected.

#2 LED “on” ... ACT automatic contrast tracking option is **enabled**. **LED “off”** ... ACT automatic contrast tracking option is **disabled**.

#1 LED “on” ... Timer is **enabled** (10 millisecond pulse stretcher). **LED “off”** ... Timer is **disabled**.

FACTORY PRESET OPTION MENU

The Smarteye-Pro photoelectric sensor options have been preset at the factory to the following status ...

#5 LED “off” ... Lock feature disabled.

#4 LED “on” ... AUTOSET will be to a “light state” set point.

#3 LED “on” ... Light “on” outputs.

#2 LED “on” ... ACT automatic contrast tracking is enabled.

#1 LED “off” ... Timer is disabled.

ACT...AUTOMATIC CONTRAST TRACKING

When enabled (#2 LED lit), the sensor will automatically track with a variety of changing conditions by adjusting itself during normal operation. For example, the sensor will continue to maintain the proper setting to compensate for changing detrimental conditions:

1. Lens or reflector contamination.
2. Scratched or damaged lens.
3. Broken fibers in light guides.
4. LED light source or thermal drift.
5. Target variations such as position, orientation or color.
6. Diminishing contrast deviation/shift caused by high speed events, particularly when input duty cycles are severely offset.

The dynamic adjustments of the sensor maintains excess gain and contrast deviation. **As automatic adjustments occur, you will see an occasional flash of the bright yellow action alert indicator.** **Note:** On rare occasions (usually associated with product inspection tasks) the ACT self-adjusting feature may have to be **disabled**.

LOCK FUNCTION

When enabled (#5 LED lit), the red (down) and green (up) commands will be disabled. In addition, the green button AUTOSET will also be disabled. This will provide tamper-proof operation. To toggle the lock function to the opposite state, hold in the red button for three seconds. Then, tap the red button once. The #5 LED should be blinking. Now, push and hold the green button for one second. Following the Quickset routine will also unlock the adjustments.

TIMER FUNCTION

When LED #1 is lit, the pulse stretcher timer function is enabled. The duration of the output will be 10 milliseconds longer than the actual input duration.

Important: When operating in the proximity mode, the light/dark option should be in the light “on” mode (LED #3 on). When operating in the beam break mode, the light/dark options should be in the dark “on” mode (LED #3 off). **This is critical if you want the timer to function properly.** This 10 millisecond minimum output duration provides ample time for the control to respond.

LIGHT/DARK OUTPUT STATUS

When #3 LED is lit, the NPN and PNP output transistors will turn “on” when the sensor is in the light state condition, i.e., Signal level above 3 on the contrast indicator. When #3 LED is off, the output transistors will be “on” when the sensor is in the “dark” state condition, i.e., below 3 on the contrast indicator.

Note: All output transistors are continuous short circuit protected. If shorted, the bargraph is disabled and the red LED output indicator will blink.

ACTION ALERT OUTPUT

A PNP output transistor switches “on” when the Action Alert is tripped. This output can be used to control a remote relay for the operation of an audible alarm or high visibility enunciator.

DIAGNOSTICS

The *SMARTEYE-PRO* sensor is equipped with two important and useful diagnostic features. The first one is the 5 LED **Contrast Indicator**, which provides “at-a-glance” analysis of the sensor’s response to the light state vs. the dark state sensing conditions. This device is not only useful in static conditions for alignment purposes, but is also functional during dynamic conditions when input events are ongoing. The second important feature is the **Action Alert** bright yellow indicator. This indicator will turn “on” whenever the highest “light state” reading, or the lowest “dark state” reading (as viewed on the contrast indicator) fails to exceed preset levels.

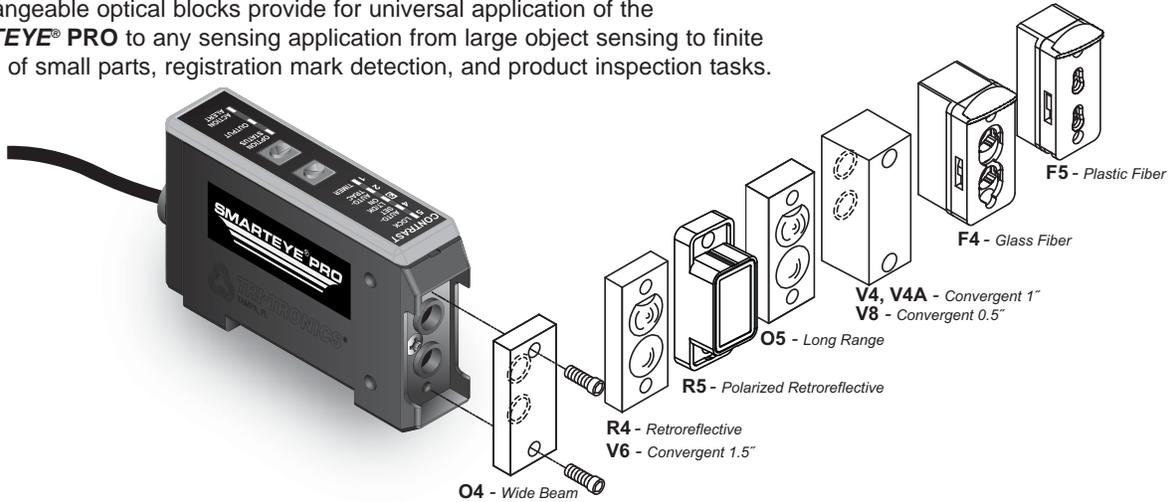
- The “light state” reading must exceed “4”
- The “dark state” reading must fall below “2”

Whenever the lightest or darkest light levels are unacceptable, the bright yellow LED indicator will be turned “on” when the light level passes through the sensor’s switch point of 3 on the contrast indicator. Both the contrast indicator and the Action Alert indicator can be viewed simultaneously during dynamic conditions when input events are ongoing.

Optical Block Selection

SMARTEYE® PRO

Interchangeable optical blocks provide for universal application of the **SMARTEYE® PRO** to any sensing application from large object sensing to finite sensing of small parts, registration mark detection, and product inspection tasks.



Type O4 Proximity

Wide beam optics useful for short-range sensing of transparent, translucent, opaque, or irregular shaped shiny objects.

Type O5 Proximity

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

Type R4 Retroreflective

Very narrow beam optics designed to sense reflectors or reflective materials at long range. Designed for Beam Break sensing.

Type R5 Polarized Anti-Glare Retroreflective

Polarized to reduce response to "hot spot" glare from shiny surface of detected object. Use with visible light source.

Type F4 Glass Fiberoptics

Adapter for use with a wide variety of glass fiberoptic light guides for both the proximity and opposed sensing modes.

Type F5 Plastic Fiberoptics

Adapter for use with a wide variety of plastic fiberoptic light guides for both the proximity and opposed sensing modes

Type V4, V4A Convergent 1" "V" Axis

Useable range of 1" to 5".

Type V6 Convergent 1.5" "V" Axis

Useable range of 1.5" to 8".

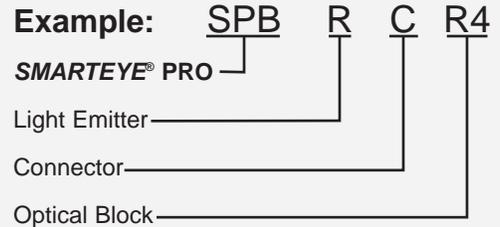
Type V8 Convergent .5" "V" Axis

Useable range of .25" to 5"

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

How To Specify:

- Select sensor type:
SPB = Includes Action Alert
- Select sensor LED light source required: I = Infrared; R = Red; B = Blue; WL = White.
- Select connection required:
Blank = Cable 6 ft. (1.8m)
C = Connector
- Select Optical Block.



Sensing Range Guidelines

1 in. = 25.4mm / 1 ft. = 0.3048 meters

Convergent / Proximity / Retroreflective

OPTICAL BLOCKS	IR	RED	BLUE	WHITE
V4, V4A	1 in.	1 in.	1 in.	1 in.
V6	1.5 in.	1.5 in.	1.5 in.	1.5 in.
V8	0.5 in.	0.5 in.	0.5 in.	0.5 in.
O4	18 in.	11 in.	4 in.	3 in.
O5	4 ft.	3 ft.	1.5 ft.	1 ft.
R4	20+ ft.	18+ ft.	6 ft.	5 ft.
R5	N/A	7 ft.	4 ft.	3 ft.

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

Glass Fiberoptics

OPTICAL BLOCKS	IR	RED	BLUE	WHITE
Opposed Mode				
F4	16 in.	1 ft.	8 in.	5 in.
F4 w/lens	20+ ft.	20+ ft.	12 ft.	9 ft.
Proximity Mode				
F4	7 in.	5 in.	1 in.	1 in.
F4 w/lens	1 ft.	1 ft.	N/A	6 in.

Note: Proximity tests utilized a .125" diameter fiber bundle.

Plastic Fiberoptics

OPTICAL BLOCKS	RED	WHITE
Opposed Mode		
F5	9 in.	2 in.
F5 w/lens	6 ft.	2 ft.
F5 w/right angle lens	3 ft.	1 ft.
Proximity Mode		
F5	7 in.	5 in.
F5 w/lens	1 ft.	1 ft.

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

Light Source Guidelines



<p>INVISIBLE INFRARED LIGHT SOURCE (880nm)</p> <p>A. Best choice in most opaque object sensing tasks</p> <p>B. Provides longest possible sensing range in either Beam Make or Beam Break sensing modes</p> <p>C. Best choice in hostile environments; useful in penetrating lens contamination</p> <p>D. Preferred for use with small glass fiberoptic light guides Note: Do not use IR light with plastic fiberoptic light guides</p> <p>E. Preferred when sensing dark colored objects in the proximity (Beam Make) mode, i.e., black, blue, green, etc.</p> <p>F. Useful in penetrating containers for verification of contents; also useful in detecting overlapped splices in dense materials</p> <p>G. Color perception; tends to favor blue colored objects</p>	<p>RED LIGHT SOURCE (660nm)</p> <p>A. Best choice for use with plastic fiberoptic light guides</p> <p>B. Useful when sensing translucent objects in proximity (Beam Make) mode</p> <p>C. Useful when sensing transparent objects in fiberoptic retroreflective (Beam Break) mode</p> <p>D. Can be polarized for retroreflective (Beam Break) sensing to reduce proxing on shiny objects</p> <p>E. Opposed fiberoptic light guides can be polarized for sensing some translucent plastic containers; consult factory for details</p> <p>F. Used as red filter for color perception advantages</p>
<p>BLUE LIGHT SOURCE (480nm)</p> <p>A. Useful for detecting translucent, transparent, plastic, or glass objects in the retroreflective mode when using the R4 optical block</p> <p>B. Used as blue filter for color perception advantages, i.e. resolving yellow vs. white colored objects or printed registration marks</p>	<p>WHITE LIGHT SOURCE (Broadband Color Spectrum)</p> <p>A. Best choice for detecting all printed registration marks on packaging material</p> <p>B. Recommended for detecting dark colored objects in the proximity (Beam Make) mode</p> <p>C. Best choice for sorting colored objects</p>

Accessories

Micro Cable Selection Guide, 5-wire M12

	<p>GSEC-6 6' (1.8m) Shielded cable</p> <hr/> <p>GSEC-15 15' (4.6m) Shielded cable</p> <hr/> <p>GSEC-25 25' (7.62m) Shielded cable</p>		
	<p>GSEC-2MU 6.5' (2.0m) Low-cost, unshielded</p> <hr/> <p>GSEC-5MU 16.4' (5.0m) Low-cost, unshielded</p>		
	<p>GRSEC-6 6' (1.8m) Right angle shielded cable</p> <hr/> <p>GRSEC-15 15' (4.6m) Right angle shielded cable</p> <hr/> <p>GRSEC-25 25' (7.62m) Right angle shielded cable</p>	<p>FMB-2 (5.1mm diam.) FMB-3 (3.1mm diam.) Miniature Glass or Plastic Fiberoptic Mounting Brackets</p>	<p>LK-4 Lens Kit (See Optical Blocks Accessories for contents)</p>

Specifications

SUPPLY VOLTAGE

- 10 to 30 VDC
- Polarity Protected

CURRENT REQUIREMENTS

- 45mA (exclusive of load)

OUTPUT TRANSISTORS

- (Current Limited)
- (1) NPN and (1) PNP sensor output transistor
- (1) PNP Action Alert output transistor
- Sensor outputs can sink or source up to 150mA
- All outputs are continuously short circuit protected
- Action Alert PNP transistor output source up to 75mA

RESPONSE TIME

- Light/Dark state response = 300 microseconds

LED LIGHT SOURCE

- Options:
 - A. Infrared = 880nm,
 - B. Red = 660nm,
 - C. Blue = 480nm,
 - D. White = Broadband spectrum
- Pulse modulated

PUSHBUTTON CONTROL

- Automatic set-up routines, i.e., QuickSet/AUTOSET
- Manual Adjustments
- Set status of five options: LOCK, AUTOSET, LT/DK ON, Auto Trac, and 10ms TIMER

INDICATORS

- 5-LED Bar graph functions in one of two modes:
 1. Contrast Indicator – Displays scaled reading of sensor's response to contrasting light levels (light to dark)
 2. Status Indicator – Displays status of 5 selectable options
- Red LED output indicator – Illuminates when the sensor's output transistors are "on." *NOTE: If Output LED flashes, a short circuit condition exists.*
- Amber LED – Illuminates when in the options select mode
- Yellow LED – Illuminates when action alert is activated. Also indicates when ACT adjusts sensor

LIGHT IMMUNITY

- Responds to sensor's pulse modulated light source, resulting in high immunity to most ambient light, including indirect sunlight

SMARTEYE® PRO



AMBIENT TEMPERATURE

- -40°C to 70°C (-40°F to 158°F)

RUGGED CONSTRUCTION

- Chemical resistant, high-impact polycarbonate housing
- Waterproof ratings: NEMA 6 and IP67
- Conforms to heavy industry grade CE requirements

HYSTERESIS

- Set for high resolution – less than one bar on the Contrast Indicator

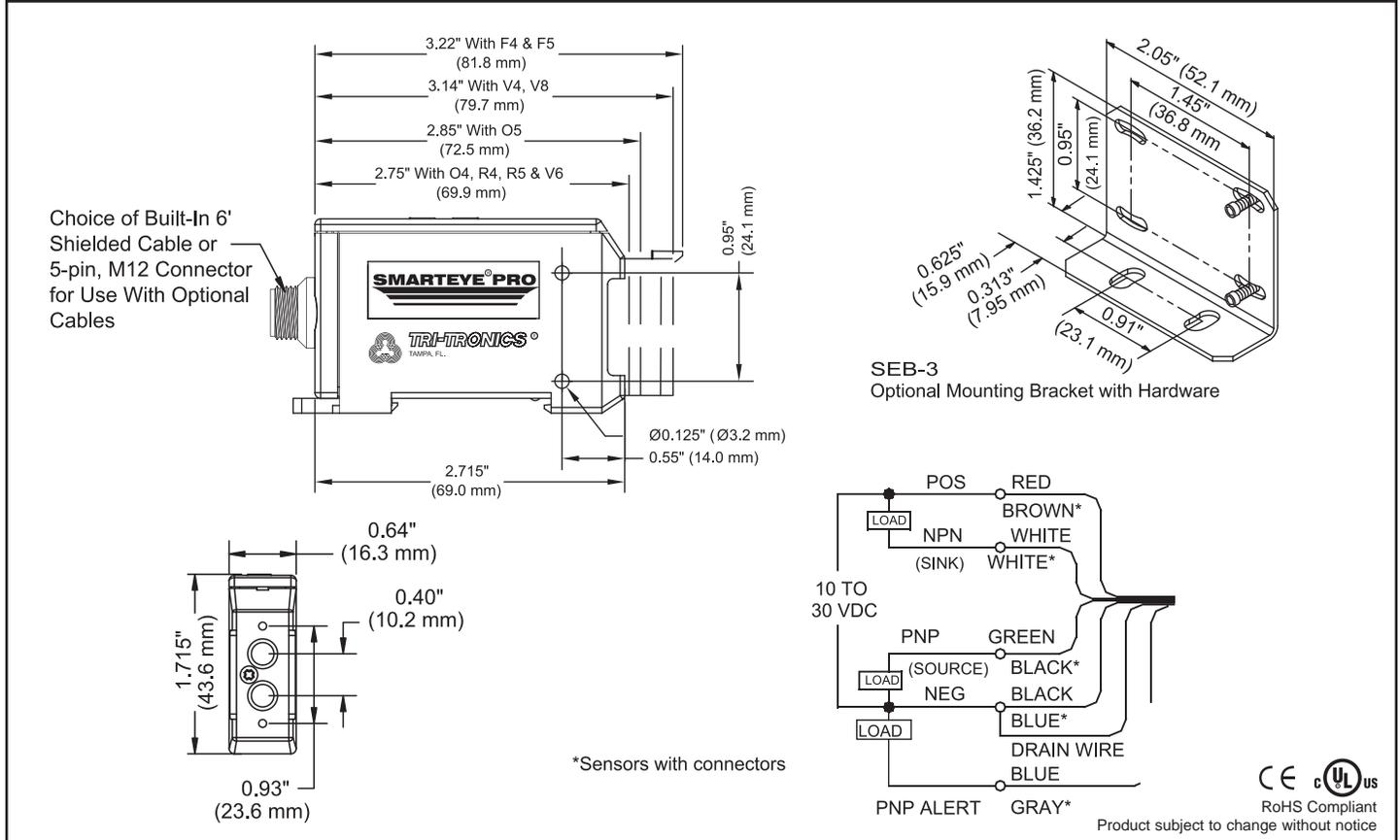


RoHS Compliant

Product subject to change without notice

Connections and Dimensions

SMARTEYE® PRO® PHOTOELECTRIC SENSOR



P.O. BOX 25135, TAMPA, FL 33622-5135
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