

Datasheet

Miniature Self-Contained DC Sensors

- Small, low-cost, self-contained sensors engineered to provide reliable sensing, primarily in straight-forward OEM applications
- Simple installation with no adjustments
- 10 V d to 30 V dc operation
- Bipolar outputs (one NPN and one PNP); each output rated at 150 milliamps
- Choose models for light operate (LO) or dark operate (DO)
- Totally solid-state and epoxy-encapsulated for unlimited life
- Very compact, yet rugged enough to withstand tough sensing environments; rated IP66, NEMA 4X



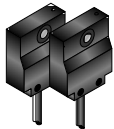
WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Additional model information:

- 9 m (30 ft) cables are available by adding suffix “**W/30**” to the model number of any cabled sensor (for example, SE61RNC W/30).
- High-speed models may be ordered by adding suffix “**MHS**” to the model number of any standard ECONO-BEAM dc sensor (for example, SE61EMHS). Response time for these sensors decreases to 1 millisecond; faster response comes at the expense of lower excess gain.

ECONO-BEAM Opposed Mode Emitter (E) and Receiver (R)



Due to their small size, right-angle design, and unique shape, this sensor pair is ideal for mounting against the side rails of conveyors for use in flow control and product sensing, and are an excellent choice for use on supermarket checkout stands. They may be bolted face-to-face to form a powerful slot sensor for edgewise sensing of opaque materials or for sensing gear teeth, timing rings, or “flags,” with enough excess gain to operate even in the dirtiest sensing environments.

One emitter and one receiver are required for use.

Models	Range	Sensing Beam	Cable	Supply Voltage	Output Type
SE61E	1.8 m (6 ft)	Infrared, 880 nm	2 m (6.5 ft)	10 to 30 V dc	n/a
SE61R					Bipolar NPN/PNP, LO
SE61RNC					Bipolar NPN/PNP, DO

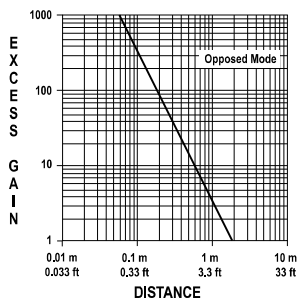
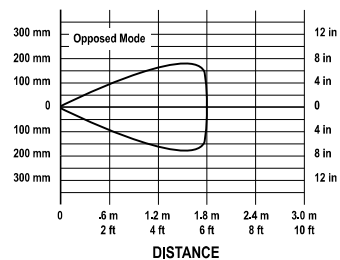


Figure 1. Emitter/Receiver Opposed Mode—Excess Gain



Effective Beam: 3 mm

Figure 2. Emitter/Receiver Opposed Mode—Beam Pattern



ECONO-BEAM Non-Polarized Retroreflective Mode



The 1/2-inch diameter effective beam of retroreflective model SE612LV, measured at 1 foot from the lens, makes it a good choice for sensing relatively small objects when opposed sensing is not possible. The visible beam simplifies alignment to the retroreflective target. Use the largest retroreflective target possible. If sensing materials with shiny surfaces, scan at an angle of at least 10° to the shiny surface to minimize false light return (“proxing” effect).

Models	Range ¹	Sensing Beam	Cable	Supply Voltage	Output Type
SE612LV	4.5 m (15 ft)	Visible red, 650 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612LVNC					Bipolar NPN/PNP, DO

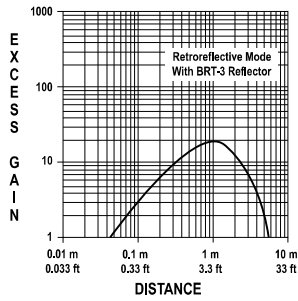


Figure 3. Non-Polarized Retroreflective Mode—Excess Gain

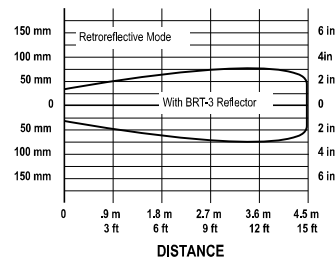


Figure 4. Non-Polarized Retroreflective Mode—Beam Pattern

ECONO-BEAM Diffuse Mode



Ideal for applications where the target’s reflectivity and profile are sufficient to return a large percentage of the emitted light back to the sensor. Divergent diffuse model SE612W is particularly useful for sensing transparent or translucent objects (clear plastic or glass) and for dependable sensing of irregular surface features; its excess gain falls off sharply beyond 1 inch. As a result, it may be used when it is necessary to ignore background objects.

Performance is based on a 90% reflectance white test card.

Models	Range	Sensing Beam	Cable	Supply Voltage	Output Type
SE612D	200 mm (8 in)	Infrared, 880 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612DNC					Bipolar NPN/PNP, DO
Divergent Diffuse					
SE612W	76 mm (3 in)	Infrared, 880 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612WNC					Bipolar NPN/PNP, DO

¹ Specified using model BRT-3 retroreflector (3-in diameter). Actual range may vary depending on retroreflector size and efficiency.

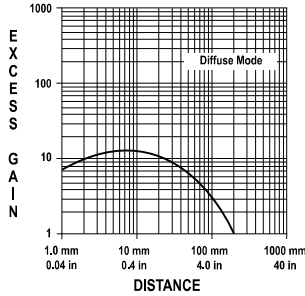


Figure 5. Diffuse Mode—Excess Gain

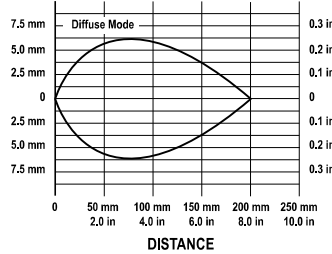


Figure 6. Diffuse Mode—Beam Pattern

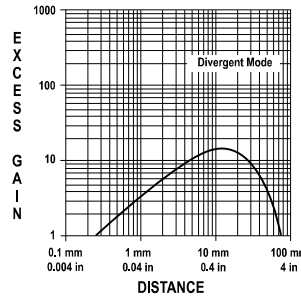


Figure 7. Divergent Diffuse Mode—Excess Gain

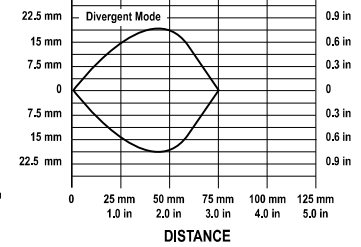


Figure 8. Divergent Diffuse Mode—Beam Pattern

ECONO-BEAM Convergent Mode



Mechanical convergent-beam sensor's light source and receiver opto-elements are positioned in the housing so that sensing takes place where the optical patterns cross. The sensing beam is intense at the 0.5-inch convergent point, excellent for sensing materials of low reflectivity and very small targets such as wire or thread; also effective for reflective sensing in areas where background suppression is a requirement. Visible red models are useful in some high-contrast color registration applications. Performance is based on a 90% reflectance white test card.

Models	Focus	Sensing Beam	Cable	Supply Voltage	Output Type
Mechanical Convergent Mode					
SE612C	12 mm (0.5 in)	Infrared, 940 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612CNC					Bipolar NPN/PNP, DO
Convergent Mode					
SE612CV	16 mm (0.65 in) Spot Size at Focus: 1.2 mm (0.05 in)	Visible red, 650 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612CVNC					Bipolar NPN/PNP, DO

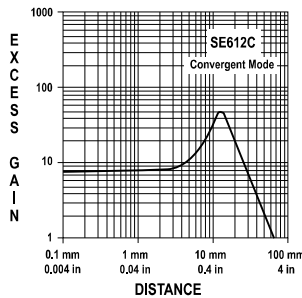


Figure 9. Mechanical Convergent Mode—Excess Gain

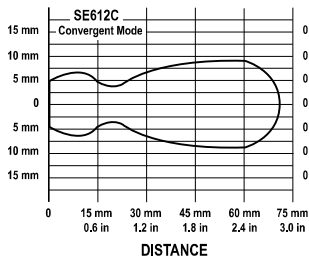


Figure 10. Mechanical Convergent Mode—Beam Pattern

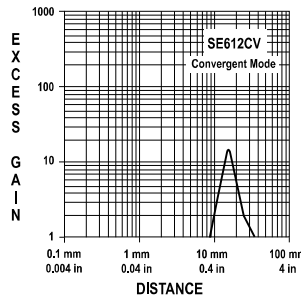


Figure 11. Convergent Mode—Excess Gain

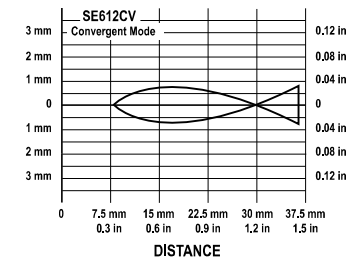


Figure 12. Convergent Mode—Beam Pattern

ECONO-BEAM Glass Fiber Optic



Ideal for situations where hostile environments or space restrictions prohibit placing the sensor itself in the sensing position. The response time required by model SE612F is 10 milliseconds (0.01 seconds). If fast-moving objects are to be detected, select a fiber optic assembly which senses the object for a long period of time. (For example, a bifurcated fiber optic with a rectangular bundle termination like model BR2.53S may be positioned so that the object is detected while it passes along the entire length of the rectangular sensing area.) Not recommended for applications requiring bending or repeated flexing of fibers. Diffuse mode performance based on 90% reflectance white test card.

Models	Range	Sensing Beam	Cable	Supply Voltage	Output Type
SE612F	Range varies by sensing mode and fiber optics used	Infrared, 880 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612FNC					Bipolar NPN/PNP, DO

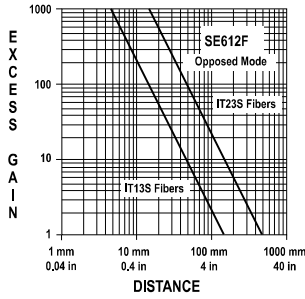


Figure 13. SE612F Opposed Mode—Excess Gain

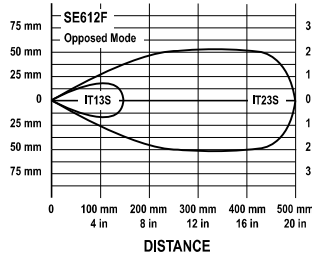


Figure 14. SE612F Opposed Mode—Beam Pattern

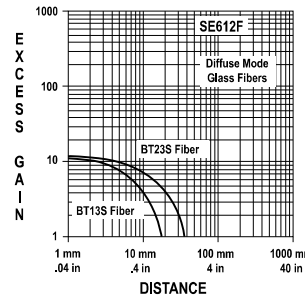


Figure 15. SE612FNC Diffuse Mode—Excess Gain

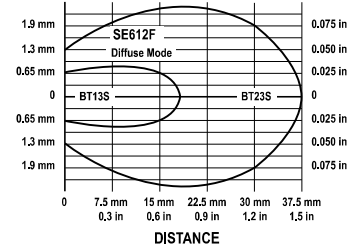


Figure 16. SE612FNC Diffuse Mode—Beam Pattern

ECONO-BEAM Plastic Fiber Optic



An excellent option where sensing must be accomplished in tight, inaccessible or volatile areas. Fibers withstand vibration and shock and are immune to electrical noise. Plastic fibers function well at temperatures between $-30\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$ ($-22\text{ }^{\circ}\text{F}$ to $+158\text{ }^{\circ}\text{F}$), and stand up to repeated flexing. Most are easy to shorten in the field, to develop custom installations. Not recommended for severe environments.

Diffuse mode performance based on 90% reflectance white test card.

Models	Range	Sensing Beam	Cable	Supply Voltage	Output Type
SE612FP	Range varies by sensing mode and fiber optics used	Visible red, 650 nm	2 m (6.5 ft)	10 to 30 V dc	Bipolar NPN/PNP, LO
SE612FPNC					Bipolar NPN/PNP, DO

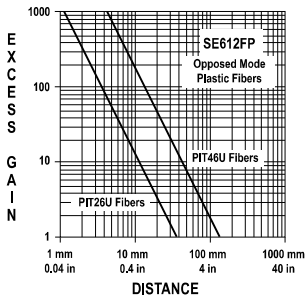


Figure 17. Opposed Mode, Plastic Fibers—Excess Gain

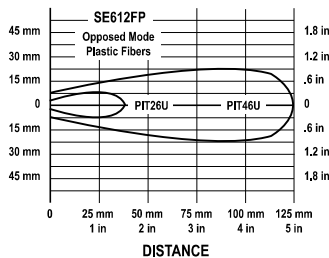


Figure 18. Opposed Mode, Plastic Fibers—Beam Pattern

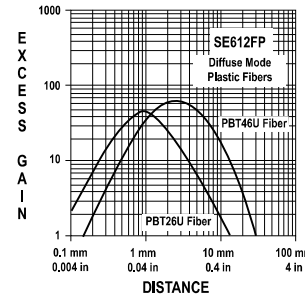


Figure 19. Diffuse Mode, Plastic Fibers—Excess Gain

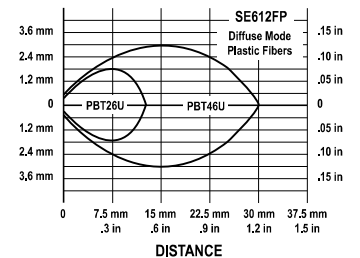


Figure 20. Diffuse Mode, Plastic Fibers—Beam Pattern

Wiring Diagrams

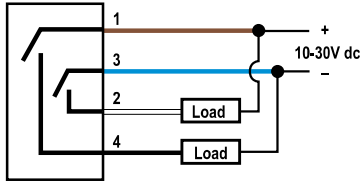


Figure 21. All Sensors Except Emitters

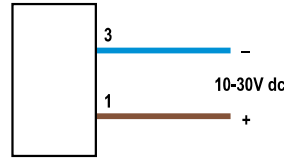


Figure 22. SE61E Emitters

Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

Specifications

Supply Voltage and Current

10 to 30V dc (10% maximum ripple) at less than 20 mA (exclusive of load)

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor

Output Rating

150 mA maximum each output

Off-state leakage current: less than 1 microamp

Output saturation voltage (PNP output): less than 1 volt at 10 mA and less than 2 volts at 150 mA

Output saturation voltage (NPN output): less than 200 millivolts at 10 mA and less than 1 volt at 150 mA

Output Protection Circuitry

Protected against false pulse on power-up

Output Response Time

Less than 10 milliseconds ON and OFF; independent of signal strength



Note: 100 millisecond delay on power-up: outputs do not conduct during this time.

MHS Models: 1 millisecond (Faster response comes at the expense of lower excess gain.)

Repeatability

0.4 ms; MHS models 0.06 ms; independent of signal strength.

Indicators

All models except emitter-only units have a top-mounted LED indicator that lights whenever the receiver "sees" its modulated light source.

Construction

Reinforced thermoplastic polyester (models LV, CV, F and FP) or polycarbonate (other models) housing, totally encapsulated for protection against moisture, vibration and corrosion.

Connections

PVC-jacketed 4-wire 2 m (6,5 ft) or 9 m (30 ft) cables

Environmental Rating

Meets NEMA standards 1, 3, 3S, 4, 4X, 12, and 13; IEC IP66

Operating Conditions

Temperature: 0 °C to +50 °C (+32 °F to +122 °F)

90% at +50 °C maximum relative humidity (non-condensing)

Required Overcurrent Protection



WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table. Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Certifications



Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

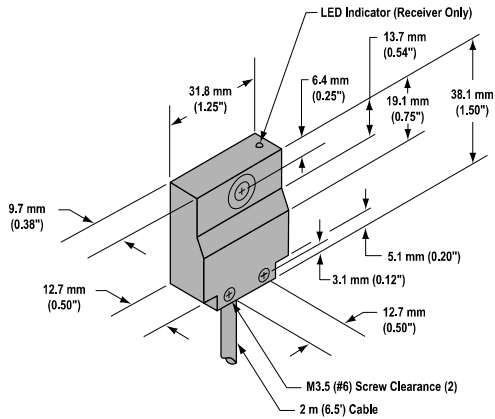


Figure 23. Opposed Mode (model suffix E & R)

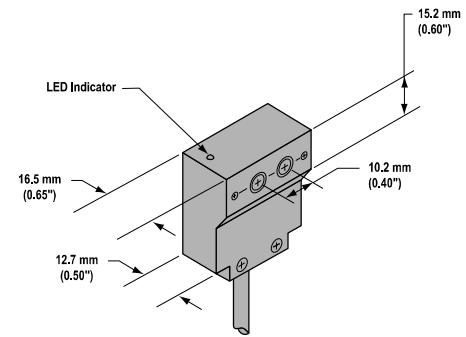


Figure 24. Diffuse & Divergent Mode (model suffix D & W)

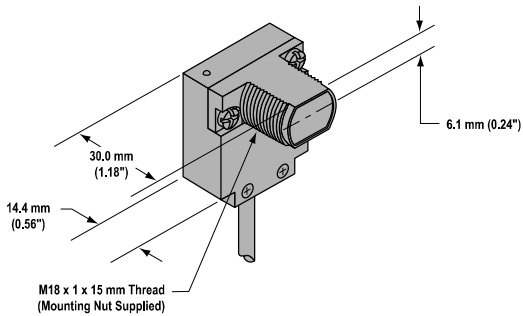


Figure 25. Retroreflective & Convergent Mode (model suffix LV & CV)

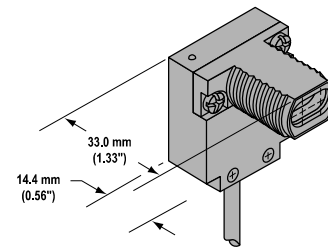


Figure 26. Glass Fiber Optic (model suffix F)

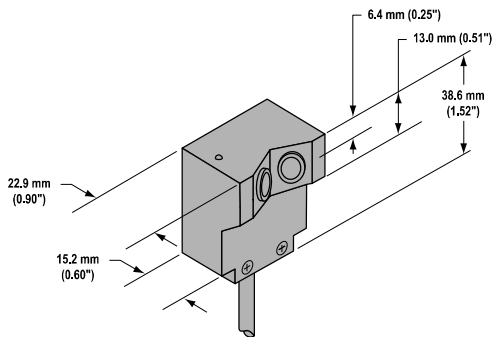


Figure 27. Mechanical Convergent Mode (model suffix C)

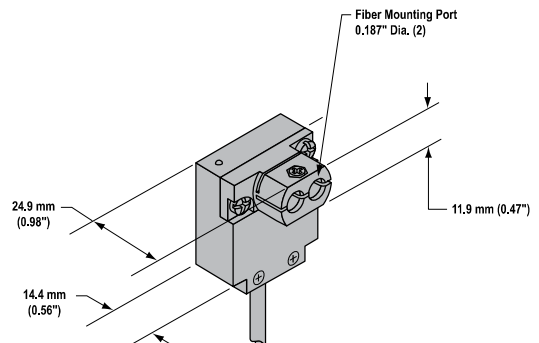


Figure 28. Plastic Fiber Optic (model suffix FP)

Retroreflective Targets



Note: The range of all retroreflective sensors is specified using target model BRT-3. Sensing range and signal strength at any given sensor-to-target distance will vary due to target reflectivity and target area. A “Reflectivity Factor” is included for each target model to help predict sensor performance, relative to the excess gain curve plotted for target model BRT-3. Consider, also, target area when predicting performance.

Model	Reflectivity Factor	Maximum Temperature	Size	Model	Reflectivity Factor	Maximum Temperature	Size
Round Retroreflectors				Miscellaneous Retroreflectors			
BRT-.6	1.0	60 °C (140 °F)	20.3 mm diameter	BRT-35X20A	1.4	60 °C (140 °F)	23.5 mm × 55 mm
BRT-1	1.0	60 °C (140 °F)	25 mm diameter	BRT-40X18A	1.0	60 °C (140 °F)	18 mm × 60 mm
BRT-1.5	1.0	60 °C (140 °F)	46 mm diameter	BRT-40X23	1.4	60 °C (140 °F)	23.5 mm × 40 mm
BRT-2B	1.0	65 °C (150 °F)	60.5 mm diameter	BRT-40X23B	1.4	60 °C (140 °F)	23.5 mm × 47.5 mm
BRT-3 ²	1.0	60 °C (140 °F)	84 mm diameter	BRT-48X32	1.0	60 °C (140 °F)	32.5 mm × 48 mm
BRT-25R	1.0	60 °C (140 °F)	25.2 mm diameter	BRT-48X32A	1.0	60 °C (140 °F)	32 mm × 65 mm
BRT-41AHT	1.0	200 °C (390 °F)	74 mm diameter	BRT-48X32B	1.0	60 °C (140 °F)	32.5 mm × 57 mm
BRT-42A	1.0	60 °C (140 °F)	42 mm diameter	BRT-53X19A	1.4	60 °C (140 °F)	19 mm × 72 mm
BRT-42D	1.0	60 °C (140 °F)	42 mm diameter	BRT-60X40C ²	1.4	60 °C (140 °F)	40.5 mm × 60 mm
BRT-50	1.0	60 °C (140 °F)	50.8 mm diameter	BRT-100X18A	1.4	60 °C (140 °F)	18.5 mm × 120 mm
BRT-50D ²	1.0	60 °C (140 °F)	50.8 mm diameter	BRT-100X50	1.5	60 °C (140 °F)	101 mm × 50.6 mm
BRT-50R ²	1.0	60 °C (140 °F)	50.8 mm diameter	BRT-100X55A	1.5	60 °C (140 °F)	132 mm × 56 mm
Square Retroreflectors				BRT-L	0.8	65 °C (150 °F)	165 mm × 19 mm
BRT-2X2	1.0	50 °C (120 °F)	61 mm × 51 mm				
BRT-77X77C ²	2.0	60 °C (140 °F)	84.5 mm × 84.5 mm				
BRT-92X92C ²	3.0	60 °C (140 °F)	100 mm × 100 mm				
BRT-4HT ^{2 3}	.15	480 °C (900 °F)	100 mm × 100 mm				

Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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For patent information, see www.bannerengineering.com/patents.

² Optional brackets are available; see <http://www.bannerengineering.com>.

³ This target has micro-prism geometry.