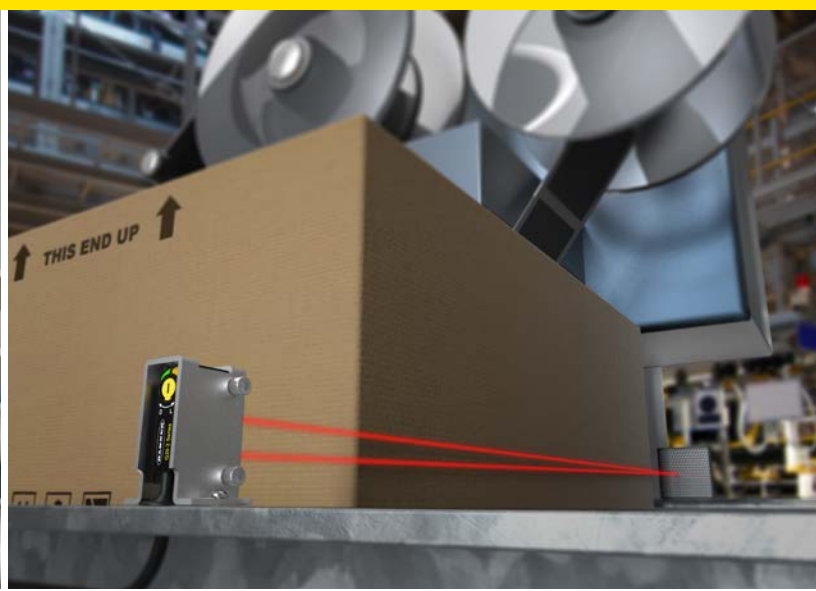


# Leading Edge Detection Solutions



# What Is Leading Edge Detection?

On equipment that moves a product, container, or package, sensors are used to detect the movement or presence of these items. Automated systems use these sensor readings to make critical decisions. Specifically, these applications rely on detecting the leading edge of the item as quickly and as accurately as possible.

## Challenges of Leading Edge Detection

### Types of Containers/Packaging

Trends in packaging have migrated from boxes to more challenging targets. Polybags, blister packs, envelopes, totes, and tubes are all commonly transported on conveyor lines and can have irregular shapes. As a result, sensing solutions need to be adapted to reliably detect all types of packaging.

### Types of Conveyors/Equipment

There are many different types of conveyors and machines used to move goods. Banner develops and supplies sensors for a wide variety of conveyor equipment.



## Types of Leading Edge Detection



Single-Point  
Leading Edge Detection



Small and Flat Object  
Leading Edge Detection



Wide-Beam  
Leading Edge Detection



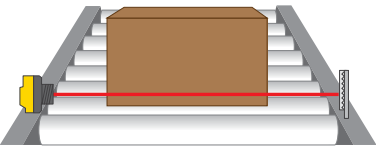
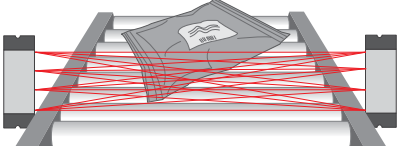
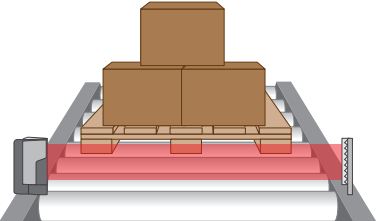
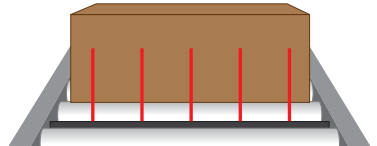
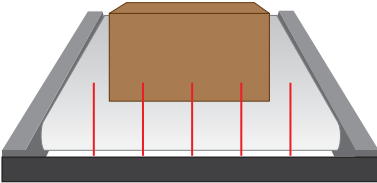
Through the Roller  
Leading Edge Detection

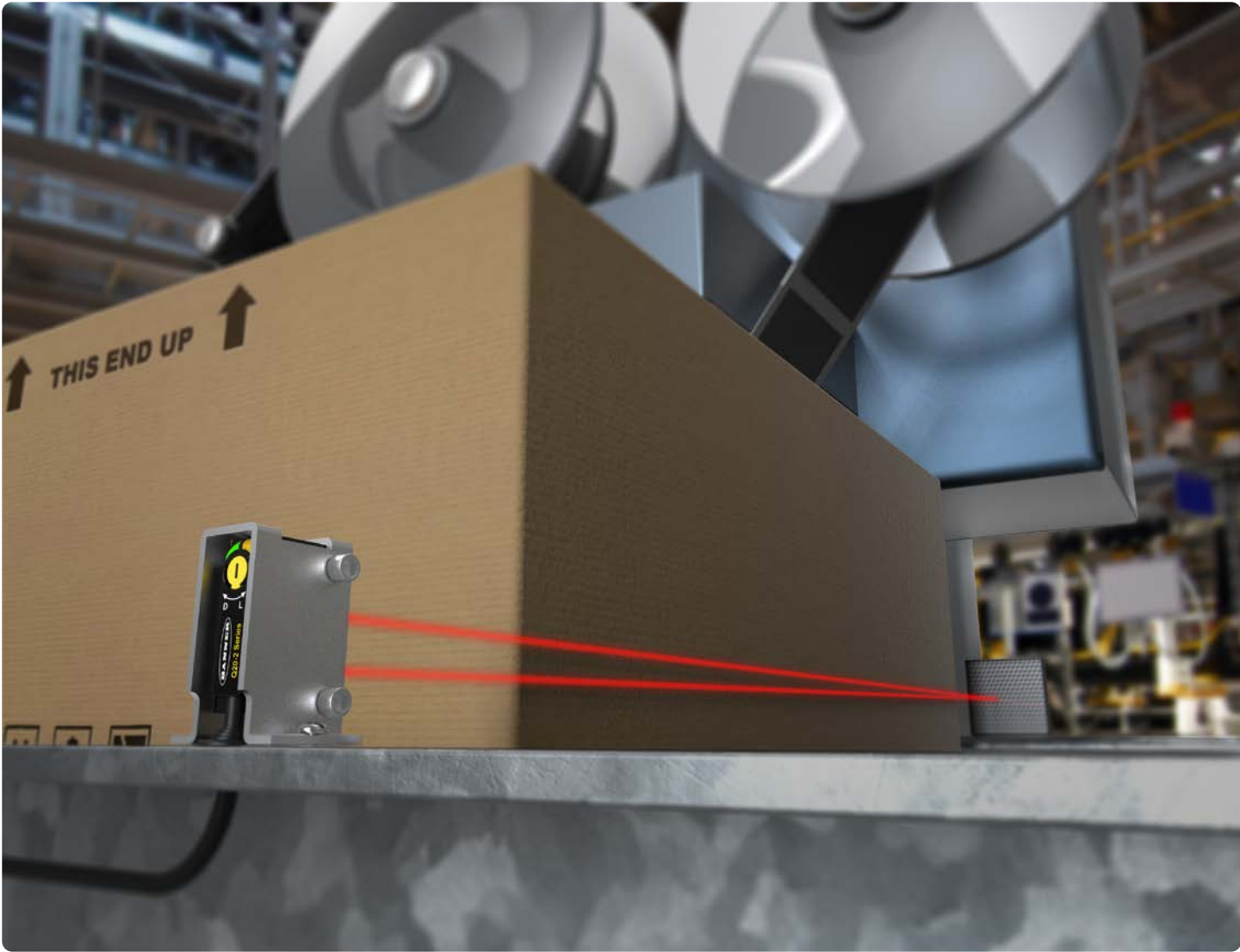


Robust Array  
Leading Edge Detection

# Choosing a Banner Sensor

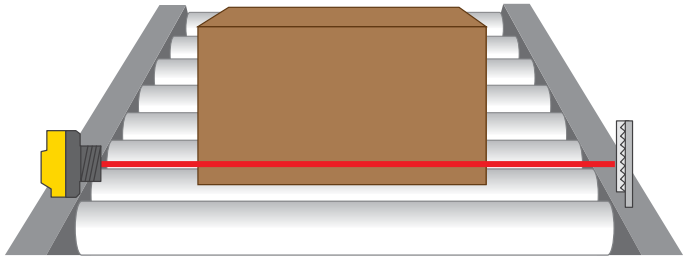
Because applications and products vary significantly, there are numerous choices when it comes to leading edge detection. For best results, select a sensor that aligns with your specific needs.

|                                                                                                                                  |                                                                                                                                           |                                                                                                                                 |                                                                                                                                          |                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Single-Point<br/>Leading Edge Detection</p>  | <p>Small and Flat Object<br/>Leading Edge Detection</p>  | <p>Wide-Beam<br/>Leading Edge Detection</p>  | <p>Through the Roller<br/>Leading Edge Detection</p>  | <p>Robust Array<br/>Leading Edge Detection</p>                                     |
| <p>QS18 or Q20-2</p>                          | <p>LX</p>                                               | <p>Q76E</p>                                | <p>TTR</p>                                           | <p>SAB</p>                                                                        |
| <p>Cost-effective yet powerful, these compact sensors detect boxes, totes, and many other objects.</p>                           | <p>This sensor's short response time and large detection area creates an accurate solution for very small or flat objects.</p>            | <p>With a wide sensing beam, this sensor detects items like pallets, polybags, or other irregularly shaped objects.</p>         | <p>An improved solution for roller conveyors, this sensor mounts easily between rollers, detecting a variety of objects.</p>             | <p>Heavy-duty sensor bar with robust housing, suitable for sorter chutes and roller-conveyor systems in which products could come in direct contact with sensors.</p> |



## Single-Point Leading Edge Detection

- Lowest cost solution
- Sufficient for many targets
- Used on conveyors with rails on the sides
- Robust sensing solution that only requires power on one side of the conveyor
- Polarization assures reliable detection of highly reflective objects



### Polarized Retroreflective Sensors

- Polarization assures reliable detection of highly reflective objects
- Fast response speed (less than 1 ms) for excellent sensing repeatability
- Features bright LED operating-status indicators for simple troubleshooting



### Q20-2 Polarized Retroreflective Sensors

- Rectangular housing for versatile mounting, with M3 threaded inserts and 25.4 mm hole spacing

| Sensing Range | Output | Operating Mode          | Connection                               | Models             |
|---------------|--------|-------------------------|------------------------------------------|--------------------|
| 5000 mm       | PNP    | LO/DO selectable switch | Integral 4-pin M12 male quick disconnect | <b>Q20-2PLP-Q5</b> |
|               | NPN    |                         |                                          | <b>Q20-2NLP-Q5</b> |

\*M12 pigtail quick disconnect models listed. Other models available on our website.



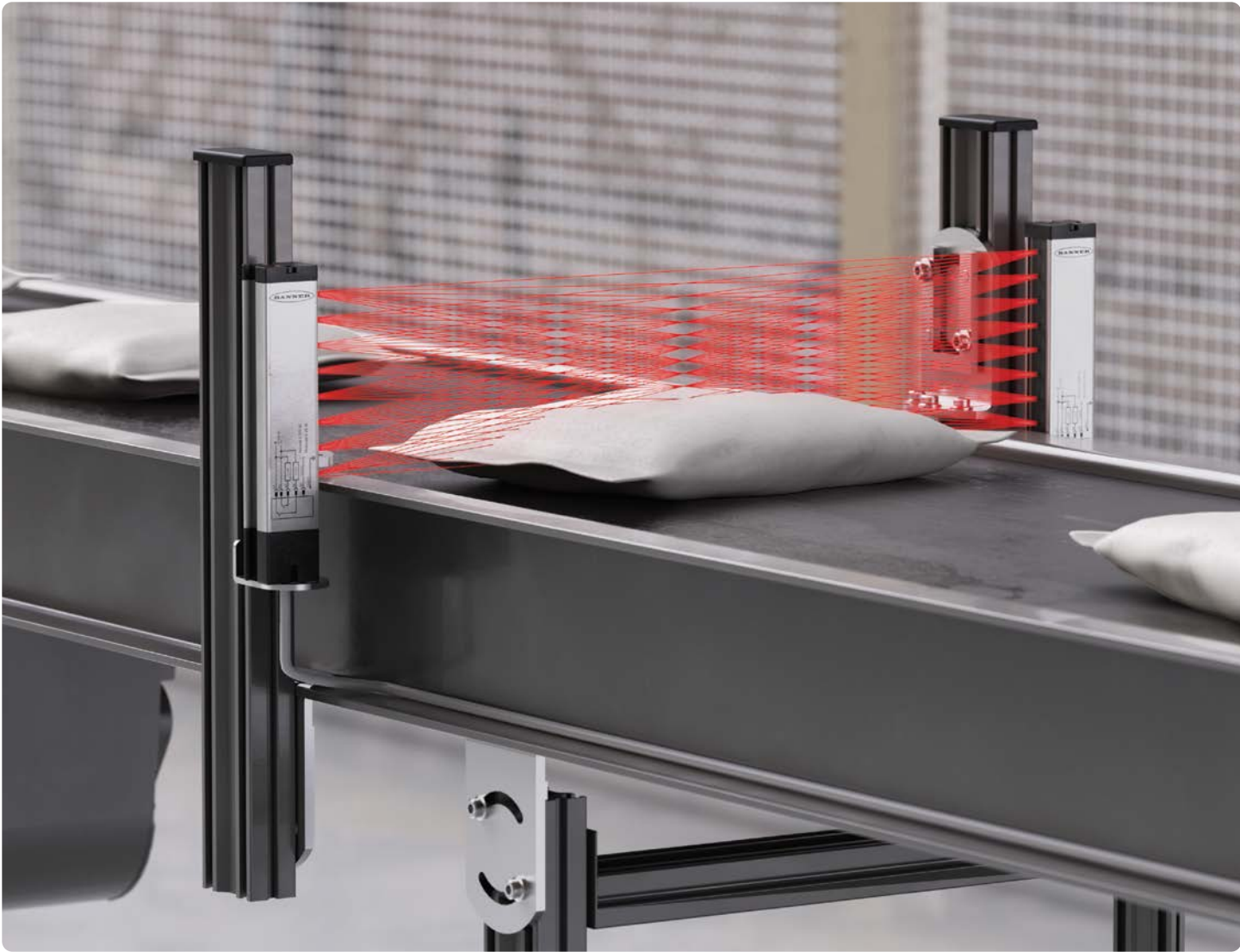
### QS18 All-Purpose Photoelectric Sensors

- Universal housing design with 18 mm threaded lens; an ideal replacement for hundreds of other sensor styles

| Sensing Range | Sensing Mode       | Connection            | Output | Models             |
|---------------|--------------------|-----------------------|--------|--------------------|
| 3.5 m         | 630 nm visible red | 4-Pin M12 integral QD | NPN    | <b>QS18VN6LPQ8</b> |
|               |                    |                       | PNP    | <b>QS18VP6LPQ8</b> |

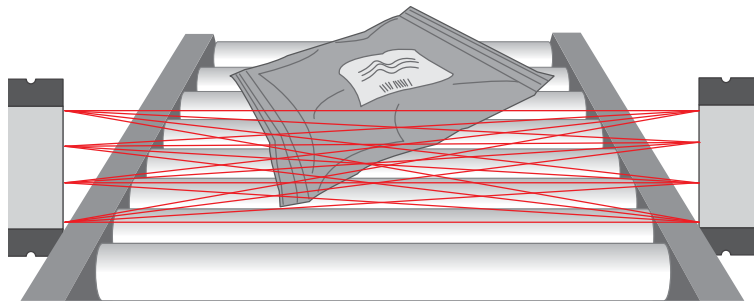
\*Integral QD models listed. Cabled and other models available on our website.

| Specifications       | QS18        | Q20-2       |
|----------------------|-------------|-------------|
| Response Speed       | 850 μs      | 850 μs      |
| Environmental Rating | IEC IP67    | IEC IP67    |
| Construction         | ABS housing | ABS housing |



## Small or Flat Leading Edge Detection

- Crosshatch beam pattern detects very small or flat packages
- Durable housing design resists damage
- High-speed response time as fast as 0.8 milliseconds



### LX Small and Flat Object Detection Sensors

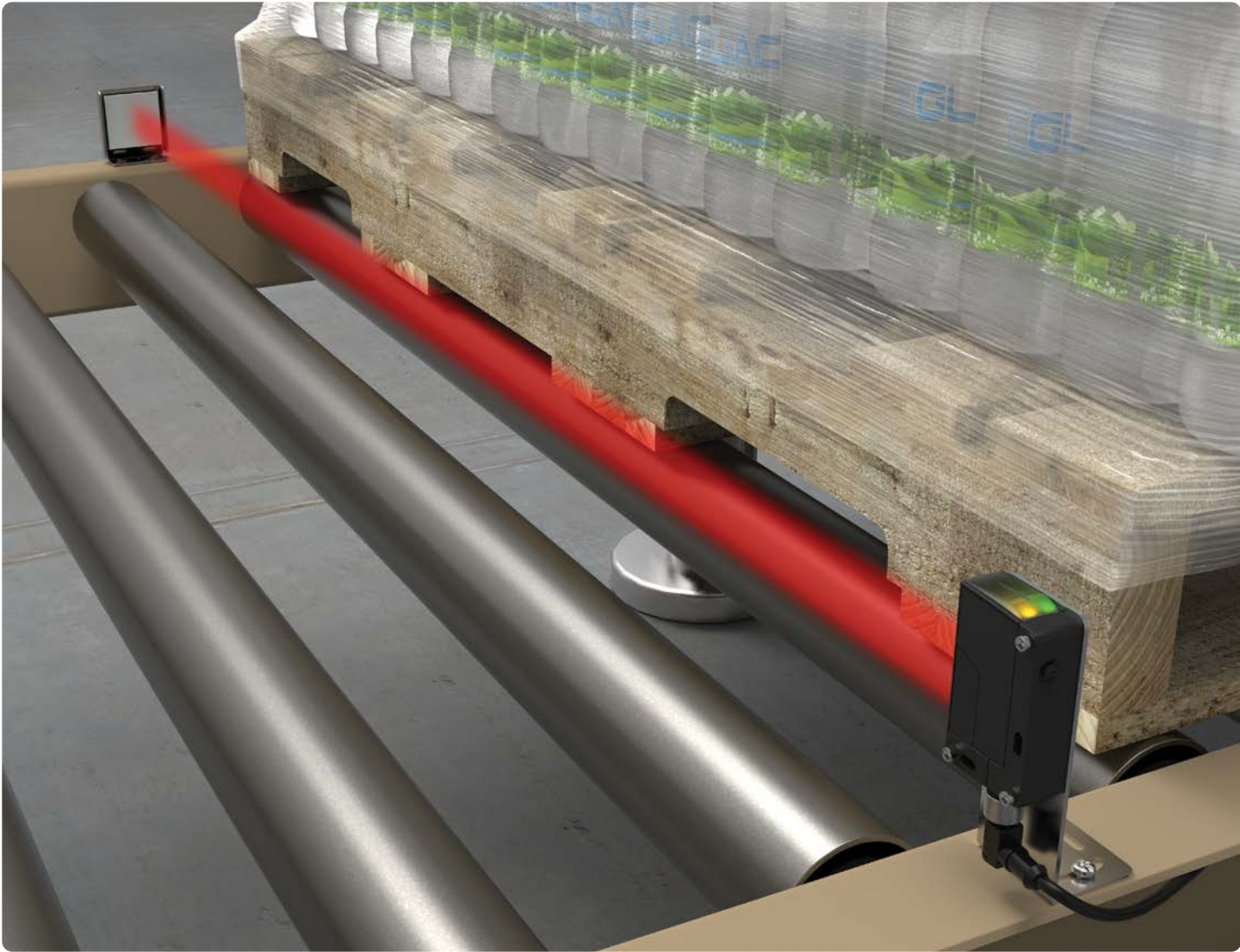
- Large sensing area to provide consistent detection of packages where the leading edge varies
- Generates a cross-hatched beam pattern that can detect objects as thin as 1 mm, including envelopes
- Response times as fast as 0.8 ms allow automated systems to operate at higher line speeds, resulting in increased throughput

| Response Time                                     | Sensing Array Length | Output Type     | Cable*                    | Models                                        |
|---------------------------------------------------|----------------------|-----------------|---------------------------|-----------------------------------------------|
| 0.8 ms ON-time, 6 ms OFF-time (5 ms OFF-delay)    | 67 mm                | Bipolar NPN/PNP | 2 m 5-wire integral cable | <b>LX3E</b> Emitter<br><b>LX3R</b> Receiver   |
| 1.6 ms ON-time, 7 ms OFF-time (5 ms OFF-delay)    | 143 mm               |                 |                           | <b>LX6E</b> Emitter<br><b>LX6R</b> Receiver   |
| 2.4 ms ON-time, 7.5 ms OFF-time (5 ms OFF-delay)  | 218 mm               |                 |                           | <b>LX9E</b> Emitter<br><b>LX9R</b> Receiver   |
| 3.2 ms ON-time, 8.5 ms OFF-time (5 ms OFF-delay)  | 295 mm               |                 |                           | <b>LX12E</b> Emitter<br><b>LX12R</b> Receiver |
| 4.0 ms ON-time, 9 ms OFF-time (5 ms OFF-delay)    | 371 mm               |                 |                           | <b>LX15E</b> Emitter<br><b>LX15R</b> Receiver |
| 4.8 ms ON-time, 10 ms OFF-time (5 ms OFF-delay)   | 447 mm               |                 |                           | <b>LX18E</b> Emitter<br><b>LX18R</b> Receiver |
| 5.6 ms ON-time, 11 ms OFF-time (5 ms OFF-delay)   | 523 mm               |                 |                           | <b>LX21E</b> Emitter<br><b>LX21R</b> Receiver |
| 6.4 ms ON-time, 11.5 ms OFF-time (5 ms OFF-delay) | 599 mm               |                 |                           | <b>LX24E</b> Emitter<br><b>LX24R</b> Receiver |
| 7.2 ms ON-time, 12 ms OFF-time (5 ms OFF-delay)   | 686 mm               |                 |                           | <b>LX27E</b> Emitter<br><b>LX27R</b> Receiver |
| 8.0 ms ON-time, 13 ms OFF-time (5 ms OFF-delay)   | 762 mm               |                 |                           | <b>LX30E</b> Emitter<br><b>LX30R</b> Receiver |
| 8.8 ms ON-time, 14 ms OFF-time (5 ms OFF-delay)   | 838 mm               |                 |                           | <b>LX33E</b> Emitter<br><b>LX33R</b> Receiver |
| 9.6 ms ON-time, 15 ms OFF-time (5 ms OFF-delay)   | 914 mm               |                 |                           | <b>LX36E</b> Emitter<br><b>LX36R</b> Receiver |

\*Integral cable models are listed.  
• To order the 5-pin M12 150 mm (6 in.) cable model, add suffix "Q" to model number (for example, LX3EQ).  
• Models with a quick disconnect require a mating cordset.

### Specifications

|                             |                                                                                                                                                     |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sensing Range</b>        | Short-range models: 75 to 150 mm or 100 to 200 mm, depending on mode<br>Standard-range models: 150 mm to 600 mm or 300 mm to 2 m, depending on mode |
| <b>Environmental Rating</b> | Meets IEC IP65                                                                                                                                      |
| <b>Construction</b>         | Aluminum housing, die-cast zinc with black e-coat painted endcaps, acrylic lens window                                                              |



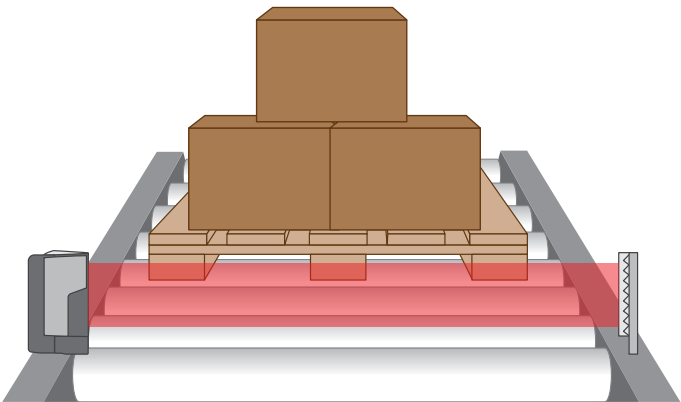
Q76E Wide-Beam Retroreflective Sensors

- Wide-beam retroreflective sensor for reliable leading edge detection of irregular shaped objects or pallets
- Visible red beam for simple alignment and bright LEDs for visual indication
- Up to 4 m range for mounting flexibility
- Two sensitivity levels for detection of challenging targets such as shrink-wrapped pallets, small objects, and film or perforated packaging
- Easy setup and adjustment, with a single push button to select light operate or dark operate (LO/DO)
- 250 Hz switching frequency for high-speed production lines
- IP67- and IP69-rated for washdown applications

| Range           | Input         | Output                                                      | Cable                                                   | Models                 |
|-----------------|---------------|-------------------------------------------------------------|---------------------------------------------------------|------------------------|
| 0.4 mm to 4.0 m | 10 to 30 V DC | Complementary PNP                                           | 200 mm PUR cable with a 4-pin M12 male quick disconnect | <b>Q76E-VP-ZLVC-Q5</b> |
|                 |               |                                                             | Integral 4-pin M12 male quick disconnect                | <b>Q76E-VP-ZLVC-Q8</b> |
|                 |               |                                                             | 2 m unterminated 3-wire PVC cable                       | <b>Q76E-VP-ZLVC-2M</b> |
|                 |               | Complementary NPN                                           | 200 mm PUR cable with a 4-pin M12 male quick disconnect | <b>Q76E-VN-ZLVC-Q5</b> |
|                 |               |                                                             | Integral 4-pin M12 male quick disconnect                | <b>Q76E-VN-ZLVC-Q8</b> |
|                 |               |                                                             | 2 m unterminated 3-wire PVC cable                       | <b>Q76E-VN-ZLVC-2M</b> |
|                 |               | 1 PNP/NPN light operate with IO-Link;<br>1 PNP dark operate | 200 mm PUR cable with a 4-pin M12 male quick disconnect | <b>Q76E-KP-ZLVC-Q5</b> |

Wide-Beam Leading Edge Detection

- Detects irregular-shaped objects
- Retroreflective sensor, only requires wiring on one side



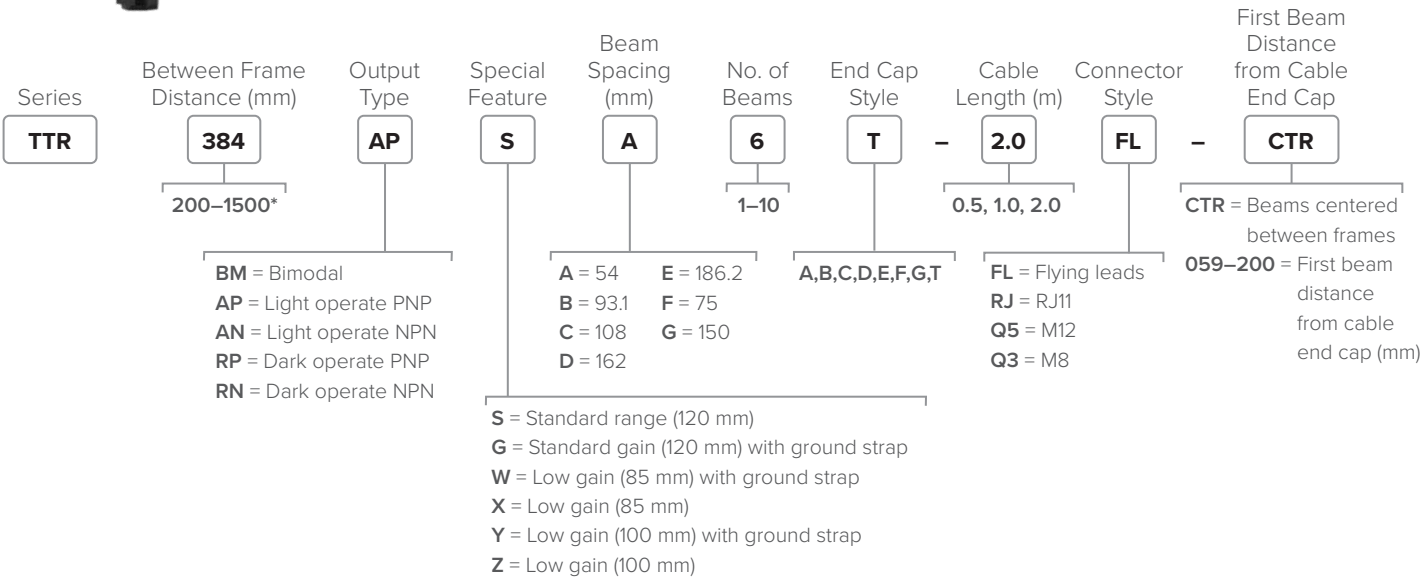
Specifications

|                               |                                 |                              |                            |                               |
|-------------------------------|---------------------------------|------------------------------|----------------------------|-------------------------------|
| Range                         | 4 m                             |                              |                            |                               |
| Response Time                 | 2 ms                            |                              |                            |                               |
| Minimum Object Detection Size | Sensitivity setting             | Max. range 100x100 reflector | Max. range 40x60 reflector | Minimum object detection size |
|                               | Standard                        | 4.0 m                        | 3.0 m                      | 19 mm                         |
|                               | Increased                       | 4.0 m                        | 3.0 m                      | 12 mm                         |
|                               | Increased with fine adjustment  | 4.0 m                        | 3.0 m                      | 8 mm                          |
| Environmental Rating          | IEC IP67, IEC IP69              |                              |                            |                               |
| Construction                  | PC-PBT housing; PMMA lens cover |                              |                            |                               |



TTR Through The Roller Sensors

- Reliable leading edge detection of letters, thin packages, poly bags, totes, boxes, or other products on roller conveyors
- Mounts between conveyor roller gap, using standard hex or round side-rail holes (no extra hardware required) or on the T-Slot (with customer-supplied bracket and hardware)
- Spring-loaded end caps reduce installation and alignment time for reduced labor costs
- Built to order with specified length and beam spacing: 200 to 1500 mm (8 to 59 in.) with two to ten sensors for maximum flexibility
- Robust aluminum housing, with resistance to ambient light and electrostatic discharge (ESD) for enhanced durability

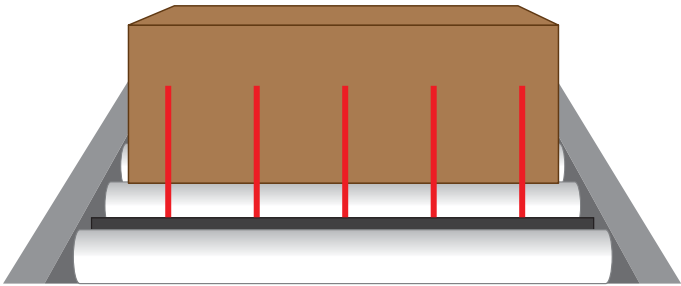


\*Max length of models with end cap styles A, B, D, E is 915 mm  
Max length of models with end cap styles C, F, G is 750 mm  
Max length of models with end cap style T is 1500 mm

To configure a model number, please contact an engineer at 763-544-3164.

Through-the-Roller Leading Edge Detection

- Designed for roller conveyors without sides for mounting sensors
- Placement below rollers offers protection from collisions with large items
- Detects irregularly shaped items



Specifications

|                               |                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------|
| Range                         | 120 mm                                                                                    |
| Output Types                  | NPN, PNP, bimodal                                                                         |
| Number of Beams               | 2 minimum, 10 maximum                                                                     |
| Maximum Length                | 1500 standard                                                                             |
| Response Time                 | 1 ms ON/OFF                                                                               |
| Minimum Object Detection Size | 54 mm beam spacing 2" x 2"<br>93.1 mm beam spacing 4" x 4"<br>162 mm beam spacing 6" x 6" |
| Environmental Rating          | IEC IP50                                                                                  |
| Construction                  | Aluminum housing                                                                          |



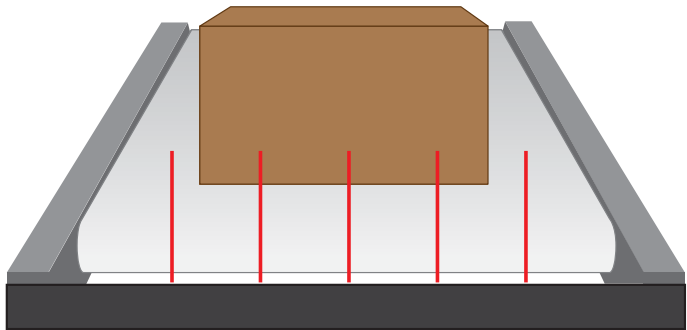
SAB Sensor Array Bars

- Customizable sensor array bar—different lengths and number of sensors
- Robust aluminum housing protects array bars in challenging environments
- One M12 connector powers the entire array bar and consolidates all outputs into one
- Polarized retroreflective, long-range diffuse, or standard diffuse array bars are available
- IEC rating of IP50
- Solid-state bipolar outputs (NPN and PNP)

| Beams | Supply Current | Sensing Range                                                                                                                                                            | Sensing Mode                                   | Output                                         | Models                 |
|-------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------|
| 6     | 150 mA         | 1 m when using a BRT-THG-2 reflector tape as a target<br><br>3 m when using five side-by-side BRT-92×92C reflectors or six side-by-side BRT-77×77C reflectors as targets | Polarized, retroreflective, visible red 624 nm | Dark operate, bipolar                          | SAB-497RB1LP6-Q5E      |
|       |                |                                                                                                                                                                          |                                                | Light operate, bipolar                         | SAB-497AB1LP6-Q5E      |
| 13    |                |                                                                                                                                                                          |                                                | Dark operate, bipolar                          | SAB-998RB1LP13-Q5E     |
| 10    |                |                                                                                                                                                                          |                                                |                                                | SAB-484RB1LP10-Q5E     |
|       | 325 mA         | 200 mm when using a 90% white card as a target                                                                                                                           | Diffuse, infrared, 940 nm                      |                                                | SAB-497RB1DS6-Q5E      |
| 6     |                |                                                                                                                                                                          |                                                |                                                | SAB-497AB1DS6-Q5E      |
| 13    |                |                                                                                                                                                                          |                                                | 762 mm when using a 90% white card as a target | Light operate, bipolar |

Robust Array Leading Edge Detection

- Heavy-duty design protects from impact
  - Ideal for detecting items moving down a chute
- Diffuse and retroreflective modes available to accommodate a variety of applications
  - Longer sensing range than TTR



| Specifications       | Polarized retro                 | Diffuse     |
|----------------------|---------------------------------|-------------|
| Range                | 3 m                             | 762 mm      |
| Response Time        | 1.5 ms ON/OFF                   | 3 ms ON/OFF |
| Array Length         | 135 mm minimum, 1219 mm maximum |             |
| Number of Beams      | 2 minimum, 18 maximum           |             |
| Beam Spacing         | 44.4 mm minimum                 |             |
| Environmental Rating | IEC IP50                        |             |
| Construction         | Black anodized aluminum housing |             |

# Smarter Automation. Better Solutions.™

Banner Engineering designs and manufactures industrial automation products including sensors, smart IIoT and industrial wireless technologies, LED lights and indicators, measurement devices, machine safety equipment, as well as barcode scanners and machine vision. These solutions help make many of the things we use every day, from food and medicine to cars and electronics. A high-quality, reliable Banner product is installed somewhere around the world every two seconds. Headquartered in Minneapolis since 1966, Banner is an industry leader with more than 10,000 products, operations on five continents, and a worldwide team of more than 5,500 employees and partners. Our dedication to innovation and personable service makes Banner a trusted source of smart automation technologies to customers around the globe.

