Radar Solutions for Vehicle Detection, Collision Avoidance, & Positioning Feedback

BANNER ®

more sensors, more solutions
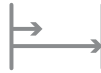
Radar Sensing

The ultimate outdoor sensing solution

Benefits of Radar Sensing

Resistant to wind, rain, snow, fog and sunlight

Long sensing range

No moving parts, durable, less downtime

Wide operating range to function in extreme outdoor environments

Detects moving and stationary objects

Operating Frequency

The longer wavelength of 24 GHz radar makes it the most robust solution for ignoring heavy falling rain and snow, while the shorter wavelength of 122 GHz radar provides more precise measurements and allows it to detect a wider range of targets, including the weak targets that 24 GHz typically cannot sense.

24 GHz

- Long range
- Most robust outdoors

glass

rock

wood

water

cereal
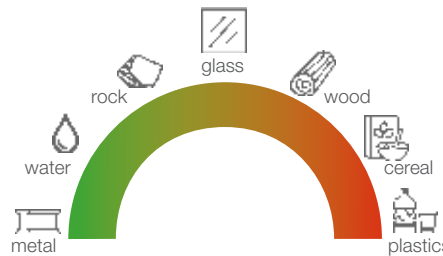
metal

plastics

122 GHz

- Better accuracy
- Can see a wider range of dielectric materials

Metal, water and other high-dielectric materials provide a stronger return signal than plastics, cloth, wood, fiberglass or organic material.

Beam Pattern Considerations

Radar Sensors are available in narrow and wide beam patterns. Narrow beam patterns avoid false detection of objects outside of the region of interest and allow for a more precise measurement, while wide beam patterns provide coverage of larger areas and provide more robust detection of irregular surfaces and targets presented at steep angles.

Narrow Beam Applications

- Drive-through
- Gantry crane
- Overhead crane
- Loading docks
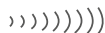
Wide Beam Applications

- Mobile equipment collision avoidance
- Vehicle detection: Train, car, boats

	T30R	QT50R	Q120R	Q240R	Q130R
Sensing Mode	Adjustable-field, Retroreflective	Adjustable-field or Retroreflective	Adjustable-field	Adjustable-field	Adjustable-field
Max. Range (m)	15	3.5, 12, or 24	12, 26, or 40	40 or 100	24 or 40
Number of Zones	2	1 or 2	1 or 2	2	1
Beam Pattern (Horz x Vert)	15° x 15° Narrow Beam	90° x 76° Wide Beam	24° x 50° Medium Beam	11° x 13° Narrow Beam	90° x 76° or 24° x 50° Medium Beam
Output	Analog & Discrete with IO-Link , Dual-discrete with IO-Link and Pulse Pro	Single or Dual-discrete	Single or Dual-discrete	Dual-discrete or Discrete and Analog	Single discrete
Configuration	PC GUI, IO-Link, Remote Teach, Push Buttons	DIP Switch	DIP Switch	DIP Switch	PC GUI or Remote Teach
Country or Region of Compliance	USA, Europe	US, Europe, China, Brazil, Japan, South Korea, Australia/New Zealand, Singapore, Taiwan, Canada	US, Europe, China, Brazil, Japan, South Korea, Australia/New Zealand, Singapore	US, Europe, China, Brazil, Japan, South Korea, Singapore, Taiwan, Canada, Mexico, Australia/New Zealand	US, Europe, China, Australia/New Zealand

Adjustable-Field (Diffuse) and Retroreflective Radar Sensors
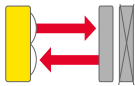
An adjustable-field radar sensor can detect vehicles and other objects by sensing the reflection of the radio waves bouncing off the object.
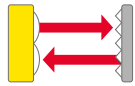
A retroreflective radar sensor uses a taught reference condition like a wall, floor, or special retroreflective target. The sensor detects objects between it and the reference target by looking for disruptions in the signal coming back from the reference target.

Retroreflective sensing has the most reliable detection with no dead zone. The output will turn on even if the object being sensed does not reflect the signal back to the sensor, as long as it blocks or disrupts the signal from the reference target.

Configuration

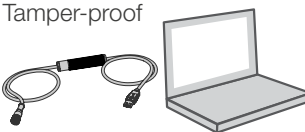### DIP Switch Configuration
• Easy to set up
• No PC required
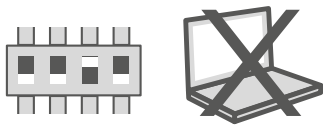
GUI Configuration
• Clear visual the entire sensor view for setup and troubleshooting
• Tamper-proof

Remote Teach
• Remotely configure sensor
• No manual interaction required

IO-Link
• Read & change device remotely
• Dynamically change parameters

IO-Link®

Push Button
• Simple configuration
• Click and teach

Collision Avoidance

In many industries including ports, mining, and agriculture, mobile equipment is a large investment and if damaged, results in downtime and requires costly repair or replacement. Banner Engineering's radar sensors are the perfect rugged solution for collision avoidance applications, even in harsh outdoor conditions. Sensing functions are unaffected by wind, rain or snow, fog, sunlight, humidity, and fluctuating air temperatures. The sensors also utilize a robust steady-state design that is more durable than laser products with moving parts.

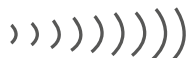## (Indoor) Overhead Crane in Dusty or Harsh Environments

Challenge

Detection from cranes to prevent collision during operation can be extra challenging in dusty or harsh environments.

Solution

- The narrow beam Q240R is used to avoid the roof and other indoor obstacles

- Radar works in dusty environments where laser products are not as reliable

- It has no moving parts and a rugged design that resists high-shock and vibration conditions and is a more reliable solution than traditional laser scanner solutions

Collision Avoidance

Challenge

Collision avoidance solutions for mining equipment minimize the risk of accidents, save costs, and improve efficiency. Poor visibility, blind spots, dust and debris, and ambient weather conditions can reduce the effectiveness of collision avoidance measures.

Solution

- Q130RA radar sensors are installed at the front and rear of mining vehicles and provide active object detection in vehicle blind spots

- The Q130RA is unaffected by dirt, dust, wind, rain, and other environmental challenges

- The IP67 housing ensures reliable operation even in harsh conditions

Narrow Beam Radar Sensors
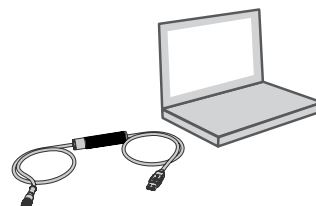
PC GUI Configuration

Crane-to-Crane Proximity Detection

Challenge

When multiple cranes are moving in tight spaces, it's imperative to ignore adjacent shipping containers while reliably detecting the presence of another crane or obstacle to activate stop or warning signals for the operator.

Solution

- The Q240R radar sensor is ideal for monitoring a specific area without detecting adjacent objects, featuring a very narrow 11° by 13° beam pattern
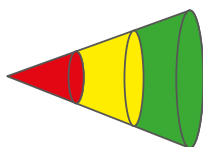
- With two independent adjustable sensing zones, the sensor provides far and near proximity warning signs with the capability to detect objects up to 100 m away

- Extremely robust; provides reliable detection capabilities, ideal for outdoor applications

Dual Zone

RTG Collision Avoidance

Challenge

Rubber tire gantry cranes (RTG) are used in port and mobile equipment industries to transport heavy and cumbersome loads. Since RTG cranes are hauling such large loads, it is vital to ensure they move safely throughout the port area to avoid collisions.

Solution

- The Q120R radar sensor has a narrow beam pattern, high sensitivity, and long range detection to view obstacles in the way of the crane

- The sensor has no moving parts and a rugged design that resists high-shock and vibration conditions better than laser scanners

No Moving Parts

Vehicle Detection and Profiling

Radar sensors use Frequency Modulated Continuous Wave (FMCW) technology to reliably detect targets, including cranes, cars, trains, trucks, and cargo in extreme weather conditions. FMCW radar is an ideal solution for these applications since it can detect moving and stationary objects in all weather conditions.

The ability to reliably detect vehicles offers significant advantages for asset management, resource allocation, site safety, traffic control, and loading dock management. Application needs and deployment requirements can be diverse, ranging from indoor, outdoor, and partially protected.

Loading Dock Monitoring, Vehicle Counting

Challenge

For an efficient flow of products in and out of a truck, it is important that operators are immediately notified of a truck's arrival. In order to accurately detect the presence of vehicles at a loading dock, a reliable sensor is needed to withstand extreme weather conditions.

Solution

- The T30R can be set up as a retroreflective sensor to provide the most reliable detection with no dead zone
- Compact housing for simple installation
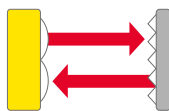
Gates and Drive Thru

Challenge

Drive thru applications require reliable vehicle detection to alert employees to a customer's presence at a window, count cars passing through, monitor time spent in the drive thru, and more. Vehicle detection devices can be susceptible to tampering by customers or staff.

Solution

- Q130RA radar sensors reliably detect both stationary and moving vehicles, regardless of shape or color
- The Q130RA is easily configured using an intuitive graphical user interface and is resistant to tampering
- The software also allows users to easily copy configurations from one sensor to another for faster setup

Retroreflective Sensing
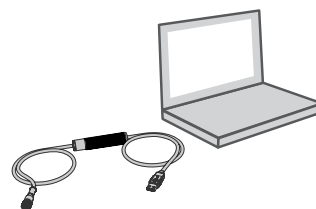
PC GUI Configuration

Boats on Waterways, Locks and Dams; Shipyard Logistics

Challenge

To establish and maintain an efficient operating routine, all vessel traffic must be monitored as it enters and exits ports. Ship detection can be difficult because of local wind and wave conditions, ship size/type, and close range noise. Sensing solutions must accurately detect a ship's arrival.

Solution

- The Q120R radar sensor functions are unaffected by wind, rain, fog, light, humidity, and air temperature, making it ideal for outdoor harbor conditions

- The radar sensor detects objects up to a specified distance, ignoring objects and backgrounds beyond the set point, allowing for accurate ship detection
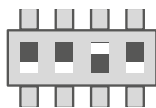
DIP Switches Configurable

Train Detection Including Flatbeds and Tank Cars

Challenge

Railways present many difficulties for sensing equipment. The harsh and dirty environment is extra challenging. Passing trains create high winds and kick up dirt. Proper identification of the content on cargo trains is essential. Radar sensors detect container trains to activate RFID antennas.

Solution

- The Q130R radar sensor is an effective alternative to ultrasonic or photoelectric sensors

- Radar technology is unaffected by wind or by dust and dirt build-up on the sensor

- FMCW radar can detect both stationary and moving targets for a more reliable solution than doppler radar

Resistant to Weather

Vehicle Detection and Profiling (continued)
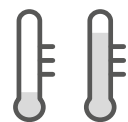
Activation of Cameras

Challenge

Trucks pass the inspection zone, where radar sensors activate cameras to verify the cargo matches the corresponding customs declaration information.

Solution

- The QT50R radar sensor is installed to sense large vehicles
- The adjustable sensing field allows it to ignore objects beyond the setpoint
- The rugged IP67 housing and radar technology is immune to weather and light changes

Wide Beam Radar Sensors

Car Wash

Challenge

Reliably detecting a vehicle in a carwash can be problematic. Steam, fog, water spray, and temperature changes are challenging for many sensors.

Solution

- The T30R can ignore fog, steam, and water to reliably detect the vehicle
- The IP67-rated housing dependably operates in a wet environment
- Superior temperature stability provides consistent measurements even during extreme temperature swings

Resistant to Weather

Positioning Feedback

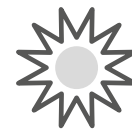Precise positioning of industrial equipment is important to prevent damage and reduce downtime, but challenging environmental conditions including rain, snow, fog, sun, and wind can make it difficult for operators to see and can impact the reliability of other sensor technology. The Banner radar provides reliable outdoor performance and the 122 GHz models provide the accurate measurements and short deadzones often required for these applications. Dual discrete outputs are available for slow and stop positions for port equipment, such as reach stackers and container handlers. Analog and IO-Link options are also available for absolute distance measurement values to guide the approach of ground support equipment, such as baggage handlers or de-icing vehicles.

Reach Stacker
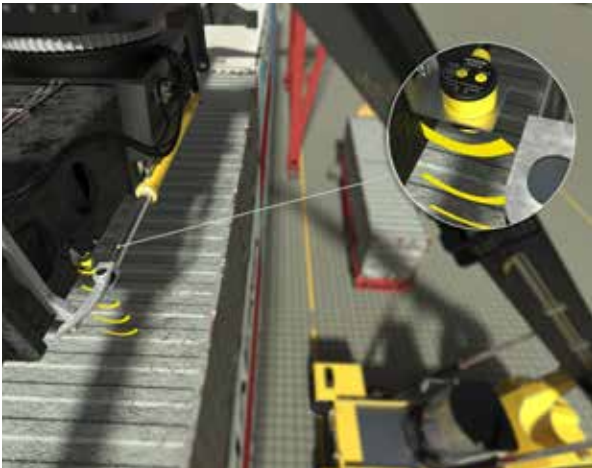
Challenge

At large ports, shipping containers need to be quickly and safely moved from one place to another. Because of this speed, lifting equipment often collides with containers resulting in lost time and damaged goods and equipment.

Solution

- The T30R with dual discrete outputs can provide collision protection with safe speed and stop positions
- The robust IP67 housing and radar beam is ideal for working outdoors
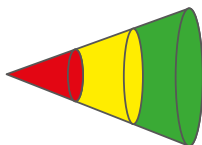
Dual Zone

Ground Support Equipment

Challenge

Damaging an airplane results in expensive repairs and disruptive delays as any contact with the aircraft requires it to be pulled from service for inspection. New standards are requiring ground support equipment such as baggage handlers to be equipped with collision avoidance sensors such as the T30R.

Solution

- The T30R measures the distance of ground support equipment from the aircraft and signals an alert when it reaches a programmed distance to prevent collisions
- The T30R can measure the target up to 15 m away and detect presence as close 150 mm
- Radar sensors are esistant to ambient weather and temperature changes

Precise Detection

Radar Configuration Software Overview

Easy setup and configuration of range, sensitivity, and output using the Banner Radar Configuration Software and Pro-Kit with Converter Cable.

- Get up and running in 3 easy steps: simply set the switch point distance, signal strength threshold, and response time using the intuitive configuration software. Now the radar sensor is ready to begin detecting targets.
- Easily monitor status via the software or bright on-board LED indicators
- Visualize the application in real-time
- Make adjustments to settings on the fly

Navigation Toolbar

Connect to the sensor, save or load a configuration, or reset to factory defaults

Live Sensor Data and Legend

Signal strength versus distance, select options to display data on the graph

Summary pane

Displays the distance to the target, the signal strength, and the output status
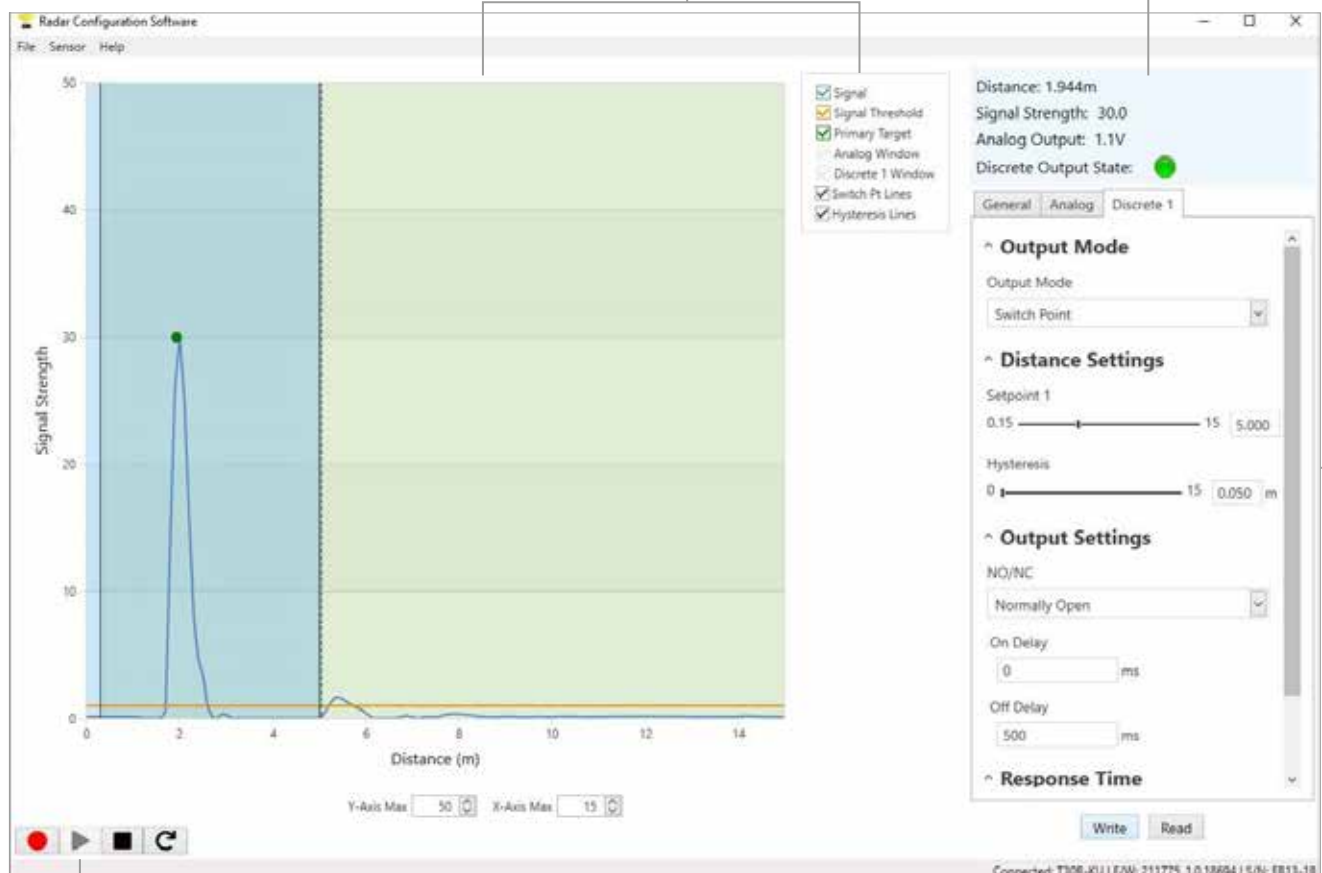
Live Sensor Data Controls

Record, freeze and play real-time sensor data

Status Bar

Shows that the sensor is connected, a software update is available, and if the sensor data is being recorded to a file

Sensor Settings

Set the sensor parameters

T30R Series

Sensors use two independent, adjustable sensing zones and operate at 122 GHz, which enables higher precision measurements with a narrow beam pattern up to 15 meters away.

Bridges the Gap Between Radar & Ultrasonics

- Compact, rugged IP67 housing for dependable, long-term operation in harsh environments
- Detects a wider range of targets than traditional 24 GHz radar including reliable detection of high-dielectric materials as well as lower dielectric materials like non-ferrous metals, wood, rock, or organic material
- Dual discrete outputs for slow and stop positions or analog and IO-Link for absolute measurement values
- Radar Configuration software, IO-Link, remote teach, and push buttons for flexible set-up and configuration
- Pulse Pro output for direct integration with Banner lights, giving direct process feedback that only requires power; no controller needed

Model	Range	Telecom Approval	Output
T30R-1515-KDQ		US, Europe	2 Discrete (NPN/PNP configurable) with IO-Link and Pulse-Pro
T30R-1515-KIQ	15 m	US, Europe	1 Analog (4-20 mA) 1 Selectable Discrete (PNP/NPN) with IO-Link
T30R-1515-KUQ		US, Europe	1 Analog (0-10 V) 1 Selectable Discrete (PNP/NPN) with IO-Link

To order the pigtail QD model, add a "P" to the end of the model number (e.g., T30R-1515-KDQP)

Optional Accessories and Mounting Brackets

SMB30A	12-gauge stainless steel right-angle bracket with curved mounting slots for versatile orientation. Mounting hole for 30 mm sensor.
SMB30MM	12-gauge stainless steel bracket with curved mounting slots for versatile orientation. Clearance for M6 (1/4 in.) hardware.
SMB30SC	Split clamp with swivel bracket with 30 mm mounting hole for sensor, black reinforced thermoplastic polyester. Stainless steel mounting hardware included.
SMB30FA	Swivel bracket with tilt and pan movement. 30 mm mounting hole. 3/8-16x2 in. bolt thread mount.
PRO-KIT	Pro Series Accessory Kit includes: Converter Cable, Splitter, and Power Supply
MQDEC2-506	2 m cordset (other lengths available)
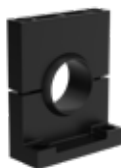
SMB30A   SMB30MM   SMB30SC   SMB30FA

PRO-KIT
Required for PC configuration

Q130RA Series

Sensors use one adjustable sensing zone to reliably detect moving or stationary objects up to 40 meters away.

PC GUI Configurable, Narrow and Wide Beam Sensor

- Reliable detection of moving and stationary targets
- Simple setup and precise control with intuitive graphical user interface
- Unaffected by ambient weather, including rain, snow, fog, sunlight, and temperatures from -40 to 65° C
- Rugged IP67 housing for dependable long-term operation in harsh environments
- Features half the dead zone of previous US radar products
- 90.8 x 170.5 mm rectangular housing

Model	Beam Pattern	Range	Telecom Approval	Output
Q130RA-9076-AFQ	90° x 76°	24 m	US, Europe, China, Australia/New Zealand	Bipolar NPN/PNP N.O/N.C. Configurable
Q130RA-2450-AFQ	24° x 50°	40 m		

Optional Accessories and Mounting Brackets

SMBWSQ120	Heavy-duty, rear-mount protective rain cover
SMBQ240SS1	2-piece bracket, provides ±20° of tilt on one axis
SMBQ240SS2	Can be used with SMBQ240SS1 for ± 20° tilt on second axis
SMBQ240SS3	Full bracket assembly, ±20° of tilt in all directions (SS1 + SS2)
MQDEC2-506	2 m cordset (other lengths available)
MQDC-506-USB	Pro Converter Cable, 1.83 m M12/Euro-style quick disconnect to Device and USB to PC, Required for connection to configuration software
QS130WS	Rain cover for Q130RA with hydrophobic coating to repel rain and prevent snow build up

MQDC-506-USB   SMBWSQ120   SMBQ240SS1   SMBQ240SS2   SMBQ240SS3   Q130WS

Q240RA Series

Sensors use two independent, adjustable sensing zones to reliably detect moving or stationary objects within a narrow beam pattern up to 100 meters away.

Narrowest Beam, Longest Range Sensor

- Narrow 11° × 13° beam pattern (± 5.5/6.5)
- Two independent adjustable sensing zones
- Range: up to 100 meters
- 187 x 160 x 55 mm rectangular housing
- Rugged IP67 housing withstands harsh environments

Model	Range	Telecom Approval	Output
Q240RA-US-AF2Q		US, Canada, Brazil, Mexico, Taiwan	
Q240RA-EU-AF2Q	40 m	US, Europe, Australia/New Zealand, Brazil Japan, Singapore, South Korea	2 Discrete (NPN/PNP configurable)
Q240RA-CN-AF2Q		China	
Q240RA-US-AF2LQ		US, Canada, Brazil, Mexico, Taiwan	
Q240RA-EU-AF2LQ	100 m	US, Europe, Australia/New Zealand, Brazil Japan, Singapore, South Korea	2 Discrete (NPN/PNP configurable)
Q240RA-CN-AF2LQ		China	
Q240RA-US-ULQ		US, Canada, Brazil, Mexico, Taiwan	
Q240RA-EU-ULQ	100 m	US, Europe, Australia/New Zealand, Brazil Japan, Singapore, South Korea	1 Analog (0-10 V) and 1 Selectable NPN/PNP
Q240RA-CN-ULQ		China	
Q240RA-US-ILQ		US, Canada, Brazil, Mexico, Taiwan	
Q240RA-EU-ILQ	100 m	US, Europe, Australia/New Zealand, Brazil Japan, Singapore, South Korea	1 Analog (4-20 mA) and 1 Selectable NPN/PNP
Q240RA-CN-ILQ		China	

Optional Accessories and Mounting Brackets

Q240WS	Rain cover for Q240RA with hydrophobic coating to repel rain and prevent snow build up
SMBQ240SS1	2-piece bracket, provides ±20° of tilt on one axis
SMBQ240SS2	Can be used with SMBQ240SS1 for ± 20° tilt on second axis
SMBQ240SS3	Full bracket assembly, ±20° of tilt in all directions (SS1 + SS2)
MQDEC2-506	2 m cordset (other lengths available)

Q240WS   SMBQ240SS1   SMBQ240SS2   SMBQ240SS3

Q120RA Series

Sensors use one or two independent, adjustable sensing zones to reliably detect moving or stationary objects up to 40+ meters away.

Highest Sensitivity, Long Range, Narrow Beam Sensor

- Narrow total beam pattern: horizontal: 24° (± 12), vertical: 50° (± 25)
- One or two independent adjustable sensing zones
- Range: up to 40 meters
- 90.8 x 159.5 mm rectangular housing
- Rugged IP67 housing withstands harsh environments

Model	Range	Telecom Approval	Output
Q120RA-US-AFQ		US and Brazil	
Q120RA-EU-AFQ	12 m	Europe, Australia/New Zealand, Japan and China	Bipolar NPN/PNP
Q120RA-KR-AFQ		South Korea*	
Q120RA-US-AF2WQ		US	
Q120RA-EU-AF2WQ	26 m	Europe, Australia/New Zealand, Japan and China	2 Discrete (NPN/PNP configurable)
Q120RA-KR-AF2WQ		South Korea*	
Q120RA-US-AF2Q		US and Brazil	
Q120RA-EU-AF2Q	40 m	Europe, Australia/New Zealand, Japan and China	2 Discrete (NPN/PNP configurable)
Q120RA-KR-AF2Q		South Korea*	

For 5-wire 2 m integral cable versions, remove suffix Q from the model number (e.g. Q120RA-EU-AF).

* Models for South Korea: 12 to 24 V dc

Optional Accessories and Mounting Brackets	
SMBWSQ120	Heavy-duty, rear-mount protective rain cover for Q120RA (sensor face must be kept free of heavy water and ice build-up)
SMBQ240SS1	2-piece bracket, provides ±20° of tilt on one axis
SMBQ240SS2	Can be used with SMBQ240SS1 for ± 20° tilt on second axis
SMBQ240SS3	Full bracket assembly, ±20° of tilt in all directions (SS1 + SS2)
MQDEC2-506	2 m cordset (other lengths available)

SMBWSQ120   SMBQ240SS1   SMBQ240SS2   SMBQ240SS3

QT50R Series

QT50R series is available in both adjustable-field models, which can use diffuse sensing to detect an object, or in retroreflective models which use a reference signal retroreflective target, floor, wall, or other stationary object) for reliable detection of weak objects.

QT50R-AF

Widest Beam, Small Package

- Detects objects up to 24 m
- One or two independent adjustable sensing zones
- Total beam pattern 90° (± 45) x 76° (± 38)
- Rugged IP67 housing withstands harsh environments

QT50R-RH

Robust Retroreflective Sensing Mode

- Detects objects up to 12 m
- Effective beam equals size of retro target
- Ignores objects in the background beyond the retroreflective target
- Rugged IP67 housing withstands harsh environments

Model	Range	Telecom Approval	Output	Sensing Mode
QT50R-US-AFHQ		US, Canada and Brazil		
QT50R-EU-AFHQ		US, Europe, Australia/New Zealand, Japan, China		
QT50R-KR-AFHQ	24 m	South Korea*	Bipolar NPN/PNP	Adjustable-field
QT50R-TW-AFHQ		Taiwan		
QT50R-SG-AFHQ		Singapore		
QT50R-US-AF2Q		US, Canada and Brazil		
QT50R-EU-AF2Q	24 m	US, Europe, Australia/New Zealand, Japan, China	2x Selectable NPN/PNP	Adjustable-field
QT50R-KR-AF2Q		South Korea		
QT50R-TW-AF2Q		Taiwan		
QT50R-EU-AFSQ	3.5 m	US, Europe, Australia/New Zealand, Japan, China	Bipolar NPN/PNP	Adjustable-field
QT50R-KR-AFSQ		South Korea*		
QT50R-US-RHQ		US, Canada and Brazil		
QT50R-EU-RHQ	0 to 12 m	US, Europe, Australia/New Zealand, Japan, China	Bipolar NPN/PNP	Retroreflective
QT50R-KR-RHQ		South Korea		
QT50R-TW-RHQ		Taiwan		

For 5-wire 2 m integral cable versions, remove suffix Q from the model number (e.g. QT50R-EU-AFH)

* Models for South Korea: 12 to 24 V dc

Optional Accessories and Mounting Brackets

BRTR-CC20E	Retroreflective target for use with QT50R retroreflective model (required accessory). Large corner-cube reflector in protective plastic enclosure. For use with -RH models.
QT50RCK	Weather deflector, includes mounting hardware (sensor face must be kept free of heavy water and ice build-up)
SMB30SC	Split clamp with swivel bracket with 30 mm mounting hole for sensor, black reinforced thermoplastic polyester. Stainless steel mounting hardware included.
SMB30MM	12-gauge stainless steel bracket with curved mounting slots for versatile orientation. Mounting hole for 30 mm sensor.
MQDEC2-506	2 m cordset (other lengths available)
QT50RWS	Rain cover for QT50R with hydrophobic coating to repel rain and prevent snow build up

BRTR-CC20E   QT50RCK   SMB30SC   SMB30MM   QT50RWS

Who is Banner?

Every 3.5 seconds, a Banner sensor is installed somewhere in the world. Banner solves problems for most of the manufacturing companies in the Fortune 500, as well as the startups changing industry with leading-edge production.

Banner technology supports manufacturing of the cars you drive, the food you eat, the medicine you take and virtually every product in your daily life. Whatever the industry, Banner offers solutions to automate production, improve efficiency and manufacture to the highest standard of quality.

Manufacturing Specialists

With over 30,000 products, Banner is a leading source for manufacturing needs. We offer award-winning sensors, wireless solutions, vision sensors and lighting, machine safety, indicator lights and LED lighting.

Application Solution Experts

Our field sales engineers are the most highly-trained and experienced professionals in the industry. They can rapidly analyze an application to help you find the best solution.

Global Presence

Banner offers worldwide sales and support through a network of more than 3,000 professionals ready to help you no matter where you are located.

Unique Solutions

Banner's growing product line includes thousands of standard products. However, if you have an application requiring a unique solution or direct integration of a Banner product, contact one of Banner's Application Engineers to learn about our rapid customization and ability to deliver special product variations.

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