Radar Solutions for Collision Avoidance & Vehicle Detection

BANNER ®

more sensors, more solutions

Radar Sensing
The ultimate outdoor sensing solution

Benefits of Radar Sensing

Unaffected by wind, rain, snow, fog and sunlight	Long sensing range	No moving parts, durable, less downtime	Detects moving and stationary objects

Wide operating range to function in extreme outdoor environments

Beam Pattern Considerations

Radar Sensors are available in narrow and wide beam patterns to avoid false detection of objects outside of your region of interest or to ensure complete detection of the desired target in your field of view.

Narrow Beam Applications

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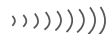
Wide Beam Applications

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

Object Detection

Good Targets Include:

Objects containing metal, large amounts of water, or similar high-dielectric materials

Poor Targets Include:

Many plastics, cloth, wood, fiberglass, and organic materials

|	**QT50R** • Wide-beam • Short to medium range	**Q120R** • Narrow beam • Medium to long range	**Q240R** • Narrowest beam • Long range • Dual zone or analog	**Q130R** • Wide or narrow beam • PC configurable
Sensing Mode	Adjustable-field or Retroreflective	Adjustable-field	Adjustable-field	Adjustable-field
Max. Range (m)	3.5, 12, or 24	12, 26, or 40	40 or 100	24 or 40
Number of Zones	1 or 2	1 or 2	2	1
Beam Pattern (Horz x Vert)	90° x 76° Wide Beam	24° x 50° Narrow Beam	11° x 13° Narrow Beam	90° x 76° or 24° x 50° Wide or Narrow Beam
Output	Single or Dual-discrete	Single or Dual-discrete	Dual-discrete or Discrete and Analog	Single discrete
Configuration	DIP Switch	DIP Switch	DIP Switch	PC GUI or Remote Teach
Country or Region of Compliance	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, Australia/New Zealand, Singapore, Taiwan, Canada, Mexico	US, Europe, China, Australia/New Zealand

Adjustable-Field 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.
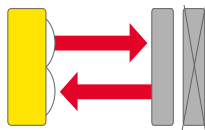
A retroreflective radar sensor uses a taught reference condition like a wall, floor, or special retroreflective target. The sensor detects objects between it and the reference target by looking for disruptions in the signal coming back from the reference target.
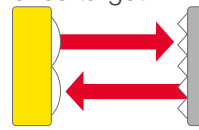
Retro sensing has the most reliable detection with no dead zone. The output will turn on even if the object being sensed does not reflect the signal back to the sensor, as long as it blocks the reference target.

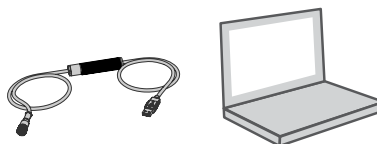## DIP Switch and GUI Configuration

DIP Switch Configuration
• Easy to set up
• No PC required
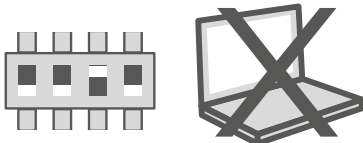
GUI Configuration
• Clear visual of configuration
• Tamper-proof

Remote Teach
• Remotely configure sensor
• No manual interaction required

Collision Avoidance

In many industries including ports, mining, and agriculture, mobile equipment is a large investment and if damaged, results in towntime 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

- 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

- Dual-zone Q240R is used to avoid the roof and other indoor obstacles

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 vvv

No Moving Parts
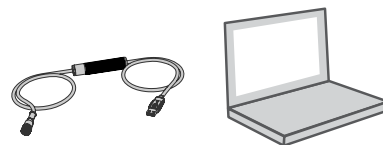
PC GUI

Crane-to-Crane Proximity Detection

Challenge
When multiple cranes are moving in tight spaces, it's imperative to reliably detect the presence of another crane or obstacle and activate stop or warning signals to 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

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

Dual Zone
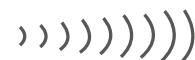
Narrow Beam Radar Sensors

Traffic Monitoring

Radar sensors use Frequency Modulated Continuous Wave (FMCW) technology to reliably detect moving or stationary targets, including cranes, cars, trains, trucks and cargo in extreme weather conditions. They operate at 24 GHz in the Industrial, Scientific and Medical (ISM) telecommunication band.

Enhance the performance of your moving assets and ensure operator and equipment safety. You can depend on products and solutions from Banner to solve your most challenging applications.

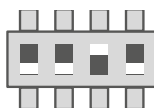## Boats on Waterways, Locks and Dams; Shipyard Logistics

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

Train Detection Including Flatbeds

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 Q120R 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

R-GAGE sensors allow for easy configuration by using DIP Switches
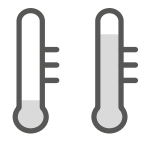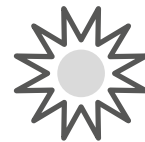
Radar Sensors are unaffected by snow, fog, heavy rain or humidity and strong wind; they are sunlight immune and operate reliable even under extreme temperature fluctuations.

Activation of Gamma Ray Gates

Challenge

Cargo trains are inspected with gamma rays to ensure the cargo matches the expected load.

Solution

- The QT50R radar sensor uses one or two independent, adjustable sensing zones for most reliable detection
- It can detect moving or stationary objects up to 24 m away
- The rugged IP67 housing withstands harsh environments

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 to ignore objects beyond the setpoint
- The rugged IP67 housing and radar technology is immune to weather and light changes

Maintenance free and vibration resistant.

Wide Beam Radar Sensors

Detection of Stationary and Moving Vehicles

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. FMCW radar is an ideal solution for these applications since it can detect moving and stationary objects in all weather conditions.

## 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 QT50R is a retroreflective sensor and provides the most reliable detection with no dead zone

- The QT50R radar sensor can sense trucks up to 12 meters away, for quick and easy detection to alert operators

- Status monitoring with the radar sensor is simple with highly bright, visible LED indicators
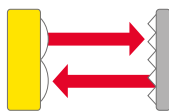
Cars in Turn Lanes, Entry/Exit Gates, Parking Ramps

Challenge

Parking lots see considerable traffic and properly managing the entrance can keep efficiency high. Typically, parking lot entrances are exposed to various weather conditions and potential impact from vehicles.

Solution

- The QT50R radar sensor detects objects up to a specified distance, ignoring objects and backgrounds beyond the set point

- The radar sensor provides reliable vehicle detection to assist in counting the number of cars passing through.

- Radar is unaffected by wind and temperature where ultrasonic solutions are not as robust

Retroreflective Sensing
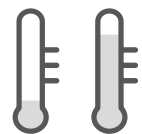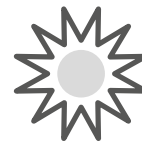
Unaffected by Weather

Parked Cars on City Streets

Challenge

To detect and count parked vehicles and prevent parking at non-permitted areas, a system is required to identify unauthorized vehicles and alert officers to their presence. Because the charging station is located in public areas, the system must not be vulnerable to vandalism.

Solution

- The QT50R radar sensor detects objects up to a specified distance, ignoring objects beyond the set point
- The radar sensor can be embedded in the charging station, preventing vandalism

Wide Beam Radar Sensors

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

- Q130 RA 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.
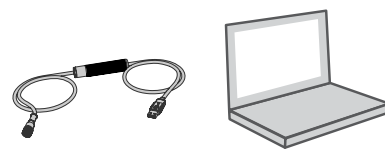
PC GUI

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 as 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 (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
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

MQDC-506-USB   SMBWSQ120   SMBQ240SS1   SMBQ240SS2   SMBQ240SS3

Radar Configuration Software Overview

Easy setup and configuration of range, sensitivity, and output using the Banner Radar Configuration Software and Pro 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
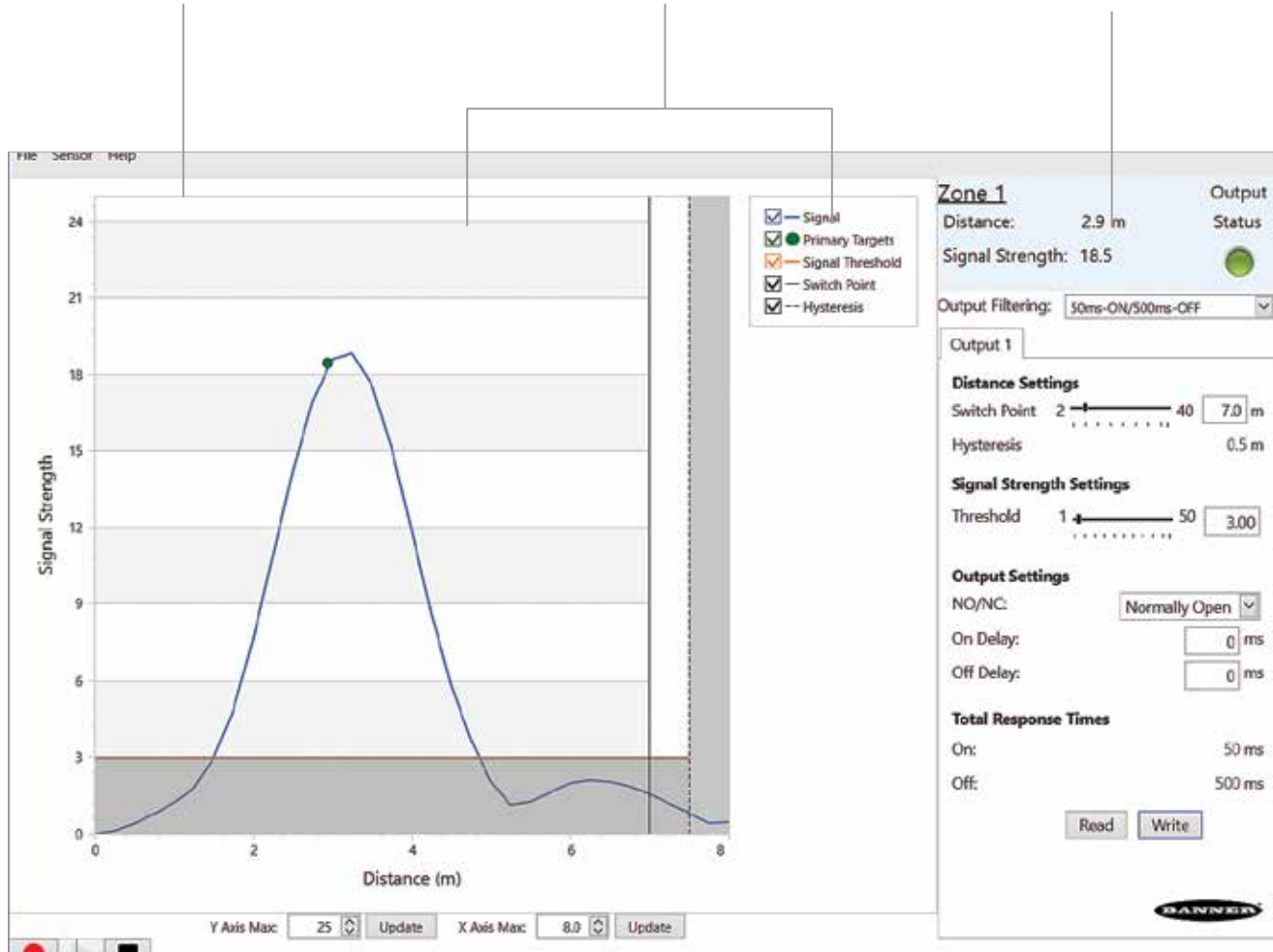
Live Sensor Data Controls

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

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
SMBQ240SS3	Full bracket assembly, ±20° of tilt in all directions (SS1 + SS2)

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
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-AF Series

Sensors use one or two independent, adjustable sensing zones to reliably detection moving or stationary objects up to 24 meters away.

Widest Beam, Smallest Sensor

- 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

Model	Range	Telecom Approval	Output
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
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
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
QT50R-KR-AFSQ		South Korea*	

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	
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)

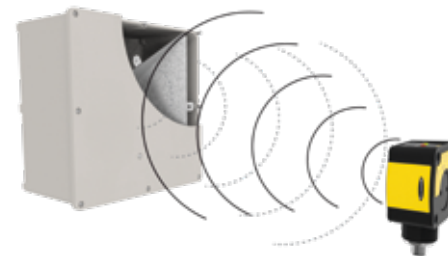QT50RCK   SMB30SC   SMB30MM

QT50R-RH Series

Retro-wave sensor – use of a reference signal (retroreflective target, floor, wall, or other stationary object) enables reliable detection of weak targets in the foreground or for loss of detection of the reference target.

Robust Retroreflective Sensing Mode

- Detects objects up to 12 m
- Effective beam angle 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
QT50R-US-RHQ		US, Canada and Brazil	
QT50R-EU-RHQ	0 to 12 m	US, Europe, Australia/New Zealand, Japan, China	Bipolar NPN/PNP
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-RH).
* 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.
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)

BRTR-CC20E   QT50RCK   SMB30SC   SMB30MM

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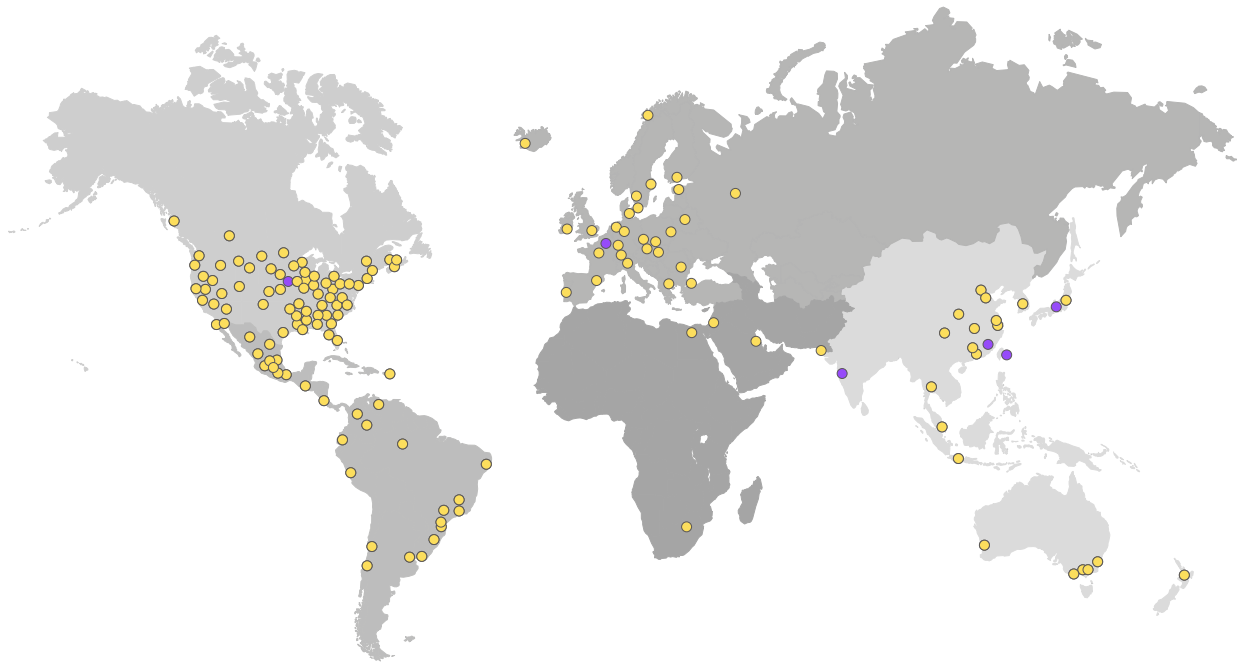
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more sensors. more solutions