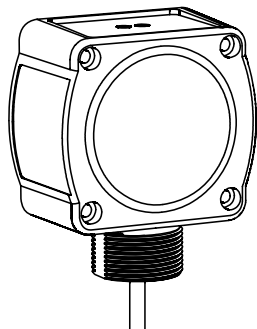


R-GAGE® QT50R-AF2 Analog Sensor



Datasheet

Radar-based dual-zone sensors for detecting and measuring moving and stationary targets



- High sensitivity radar with a range up to 24 meters for robust target detection
- Analog or discrete outputs for measuring and detection applications
- FMCW radar for detecting moving and stationary objects
- Adjustable sensing field and ability to ignore objects beyond a setpoint, two zones available
- Rugged IP67 housing and sensing functions to operate in environments with wind, falling rain or snow, fog, humidity, air temperatures, or light
- Easy setup and configuration of range, sensitivity, and output with simple DIP switches
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band; no special license required



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.

Models

Models ¹	Maximum Range	Supply Voltage	Connection	Telecom Approval ²	Output
QT50R-EU-AF2UQP	24 m (78 feet)	12 V DC to 30 V DC	150 mm (6 in) with a M12 8-pin quick disconnect	Telecom approved for US, Europe, UK, Australia, New Zealand, China, and Japan	DIP-switch-selectable NPN or PNP and N.O. or N.C. and 0–10 V Analog

Overview

The R-GAGE sensor emits a well-defined beam of high-frequency radio waves from an internal antenna. Some of this emitted energy is reflected back to the receiving antenna. Signal processing electronics determine the distance from the sensor to the object based on the time delay of the return signal. The sensor can be configured to two independent sensing zones.

The two sensing zones are factory pre-set to default distances; they can be reconfigured for different distances using the DIP switches on the back of the sensor. The sensor is plug-in ready for immediate operation.

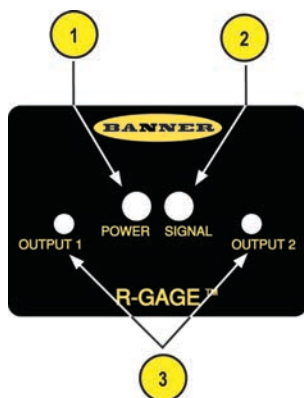
The sensitivity is precalibrated at the factory, assuming that the sensing field will be clear of obstacles. The sensitivity can be adjusted using the DIP switches.

¹ Models with a quick disconnect require a mating cordset; see [Quick Disconnect \(QD\) Cordsets](#) on p. 7.

² For additional countries, contact Banner Engineering.



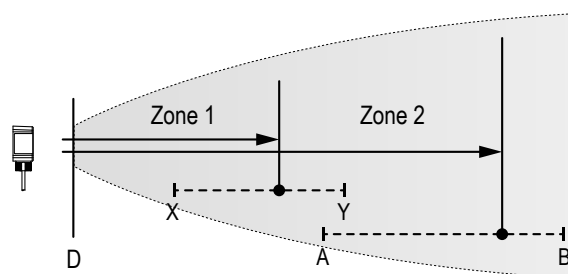
Figure 1. R-GAGE Features



1. **Power LED:** Green (power ON)
2. **Signal Strength LED:** Red, flashes in proportion to signal strength. Steady on at 4x excess gain. Only indicates signal amplitude, not target distance.
3. **Output LEDs:** Yellow (output energized) / Red (configuration)

Access the DIP switches behind the threaded cap on the back of the sensor (not shown). Access the DIP switches behind the threaded cap on the sensor back (not shown)

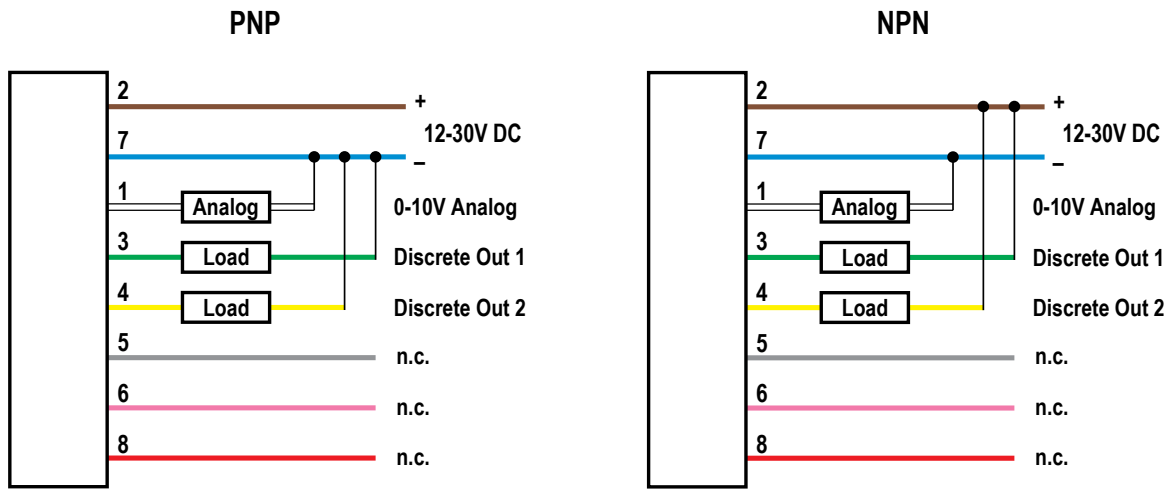
Figure 2. R-GAGE Sensing Zone Distances



		EU Models
X	Minimum Zone 1 Distance	1.5 m (4.9 ft)
Y	Maximum Zone 1 Distance	12 m (39.4 ft)
A	Minimum Zone 2 Distance	8 m (26.2 ft)
B	Maximum Zone 2 Distance	24 m (78.7 ft)
D	Dead Zone ³	

³ Typical dead zone: 0.3 m (1 ft) for moving and 0.5 m (1.6 ft) for stationary targets, but varies with target reflectivity.

Wiring



Wiring Key:

Wire	Color	Description
1	White	Zone 2 Analog Voltage Output
2	Brown	V+
3	Green	Discrete Zone 1 Output
4	Yellow	Discrete Zone 2 Output
5	Gray	Do not connect
6	Pink	Do not connect
7	Blue	V- / Analog Ground
8	Red	Do not connect



Note: Banner recommends that the shield wire (quick disconnect (QD) fitting cordsets only) be connected to earth ground or dc common. Shielded cordsets are recommended for all QD models.

Sensor Configuration

The sensing zone distance, sensitivity, and output configuration can be selected via the DIP switches on the back of the sensor. Use the included spanner to open the screw-off cover on the back of the sensor and access the DIP switches.



Important: Tighten the DIP switch cover a full quarter turn after contact to maintain the watertight seal.

DIP Switch Functions

Switch	Function
1, 2, 3	Zone 1 and Zone 2 distance pairs
4, 5	Sensitivity
6	Dual NPN/PNP output functionality
7	Normally Open/Normally Closed output functionality
8	Response Speed

DIP switch 1 is on the left and DIP switch 8 is on the right.

Distance Settings

* Default settings

Switch 1	Switch 2	Switch 3	Zone 1	Zone 2
0	0	0	1.5 m (4.9 ft)	4 m (13.1 ft)
0	0	1	2 m (6.6 ft)	6 m (19.7 ft)
0	1	0	3 m (9.8 ft)	8 m (26.2 ft)
0*	1*	1*	4 m (13.1 ft)	10 m (32.8 ft)
1	0	0	6 m (19.7 ft)	12 m (39.4 ft)
1	0	1	8 m (26.2 ft)	16 m (52.5 ft)
1	1	0	10 m (32.8 ft)	20 m (65.6 ft)
1	1	1	12 m (39.4 ft)	24 m (78.7 ft)



Note: Highest sensitivity is achieved only if sensing distance is 8 m (26.2 ft) or less

Sensitivity Selection

* Default settings

Switch 4	Switch 5	Sensitivity
0*	0*	4 (Highest)
0	1	3 (High)
1	0	2 (Medium)
1	1	1 (Low)

Output Configuration

* Default settings

Switch 6	NPN / PNP	Switch 7	NO / NC
0*	NPN	0*	NO
1	PNP	1	NC

Response Speed

* Default settings

Switch 8	On Total	Off Total	Total
0	30	70	100
1*	50	300	350

Analog Output: Zone 2

Output Voltage	Distance
0.5 V to 1.0 V	< 0.5 m
1.0 V	0.5 m
9.0 V	Zone 2
9.0 V to 9.5 V	> Zone 2
10.5 V	Loss of Signal

Specifications

Range

The sensor is able to detect a proper object (see Detectable Objects) from 0.5 m to 24 m (1.6 ft to 78.7 ft), depending on target

Detectable Objects

Objects containing metal, water, or similar high-dielectric materials

Operating Principle

Frequency modulated continuous-wave (FMCW) radar

Operating Frequency

EU Models: 24.050–24.250 GHz, ISM Band

Supply Voltage

12 V DC to 30 V DC, less than 100 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient overvoltages

Delay at Power-up

Less than 2 seconds

Output Configuration

DIP switch 6 selects dual NPN (default) or dual PNP operation; DIP switch 7 selects N.O. (default) or N.C. operation; 150mA each

- **Zone 1 output:** yellow wire
- **Zone 2 output:** green wire

Analog output (White Wire): 0 V to 10.5 V

Output Protection

Protected against short circuit conditions

Response Time

DIP switch 8 selects ON/OFF response time

Analog Linearity

±0.5 m

Analog Resolution

0.25 m

Analog voltage output

2.5 kΩ minimum load resistance

Indicators

Power LED: Green (power ON)

Signal Strength LED: Red, flashes in proportion to signal strength. Steady on at 4x excess gain. Only indicates signal amplitude, not target distance.

Output LEDs: Yellow (output energized) / Red (configuration)

Adjustments

DIP-switch-configurable sensing distance, sensitivity, response time, and output configuration

Construction

Housing: ABS/polycarbonate

Lightpipes: Acrylic

Access Cap: Polyester

Operating Temperature

–40 °C to +65 °C (–40 °F to +149 °F)

Temperature Effect

0.05 m/°C, typical

Environmental Rating

IP67

Connections

Integral 150 mm (6 in) cable with an 8-pin M12 quick disconnect. Quick disconnect models require a mating cordset.

Certifications



ETSI/EN 300 440

FCC part 15

ARIB STD T-73

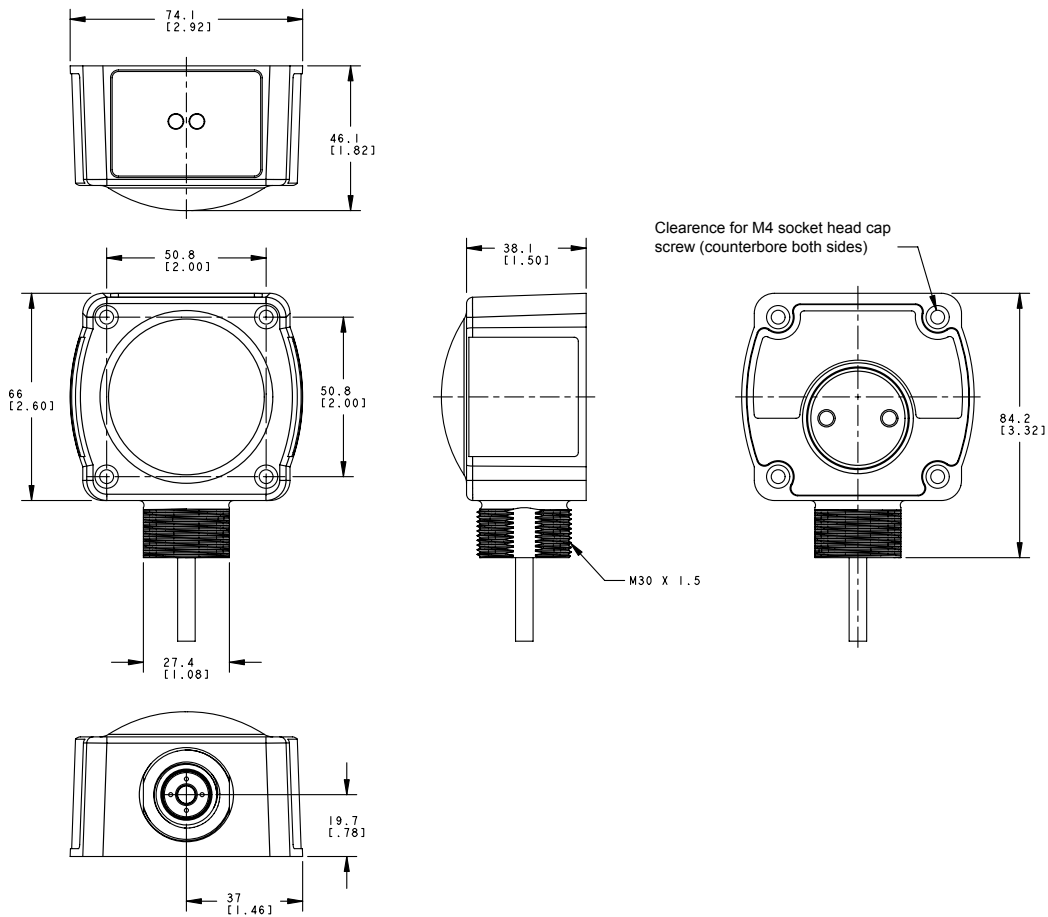
for others, contact Banner Engineering.

Country of Origin: USA

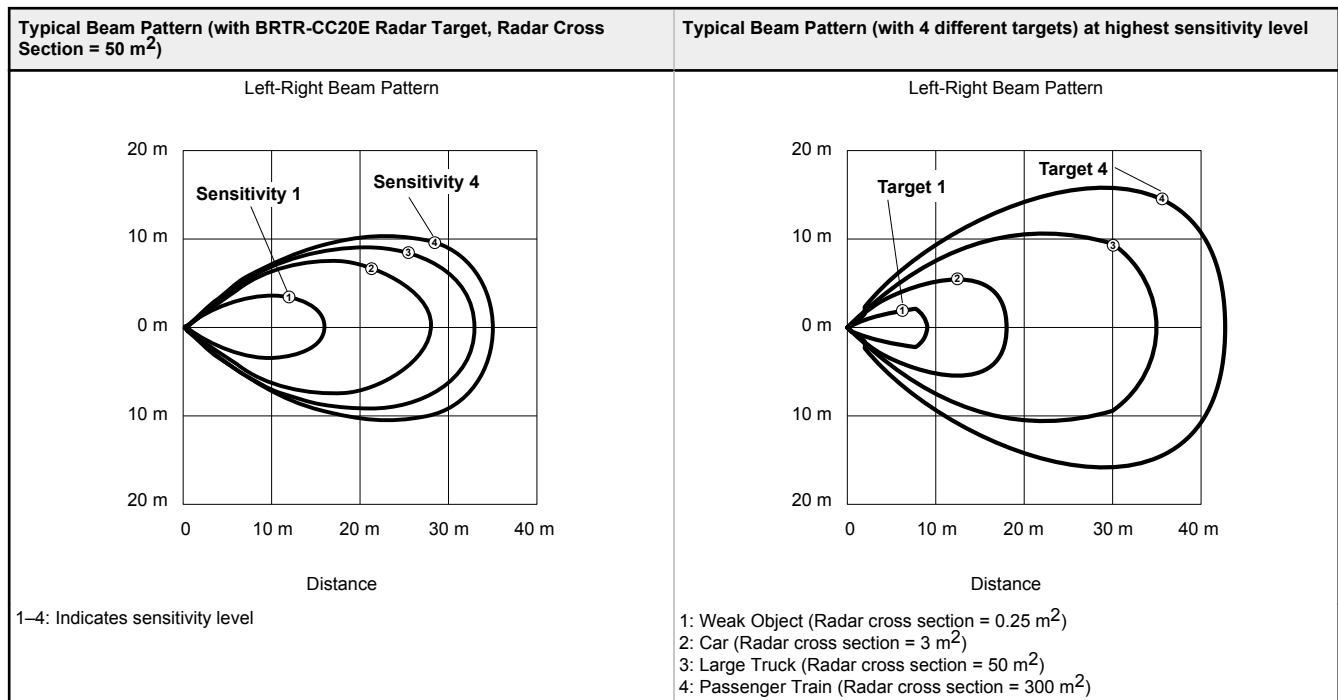
FCC ID: UE3QT50RUS—This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Dimensions

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



Beam Pattern





Note: The effective beam pattern depends on the sensitivity level and target properties.

Windows

The R-GAGE sensor can be placed behind a glass or a plastic window, but the configuration must be tested and the distance from the sensor to the window must be determined and controlled prior to installation. There is typically a 20% signal reduction when the sensor is placed behind a window.

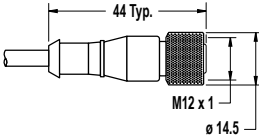
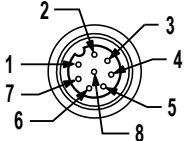
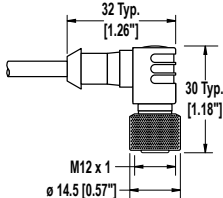
Polycarbonate at 4 mm thickness performs well in most situations, but the performance depends on filler materials. Thinner (1 to 3 mm) windows have high reflection. The amount of reflection depends on the material, thickness, and distance from the sensor to the window.

Locate the sensor in a position of minimum reflection from the window, which will repeat every 6.1 mm of distance between the sensor and the window. The positions of maximum reflection from the window repeat between the minimums, and decrease in effect until the window is approximately 150 mm (5.9 in) away. Consult the factory for pre-tested window materials which can be used at any distance without issue.

Additionally, the face of the window should be protected from flowing water and ice by use of a flow diverter or hood directly above the window. Falling rain or snow in the air in front of the window, light water mist, or small beads on the face of the window are typically not an issue. However, a thick, continuous surface of water or ice directly on the face of the window can be detected as a dielectric boundary.

Accessories

Quick Disconnect (QD) Cordsets

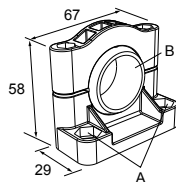
8-Pin Threaded M12 Cordsets with Open-Shield—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC2S-806	2.04 m (6.7 ft)	Straight		 1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red
MQDC2S-815	5.04 m (16.54 ft)			
MQDC2S-830	10.04 m (32.95 ft)			
MQDC2S-850	16 m (52.49 ft)			
MQDC2S-806RA	2 m (6.56 ft)	Right-Angle		
MQDC2S-815RA	5 m (16.4 ft)			
MQDC2S-830RA	10 m (32.81 ft)			
MQDC2S-850RA	16 m (52.49 ft)			

Mounting Brackets

All measurements are listed in millimeters, unless noted otherwise.

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included

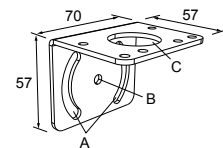


Hole center spacing: A=ø 50.8

Hole size: A=ø 7.0, B=ø 30.0

SMB30MM

- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor



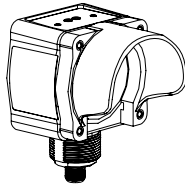
Hole center spacing: A = 51, A to B = 25.4

Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1

Weather Deflectors and Shields

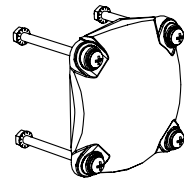
QT50RCK Weather Deflector

- Required if the R-GAGE is exposed to rain or snow
- Prevents buildup of water or ice from interfering with sensor performance



QT50RWS Weather Shield

- Coated to help repel water and maximize signal strength
- Hardware included for easy installation and replacement



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.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

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



more sensors, more solutions