

R-GAGE® Q130RA-AF Sensor

Instruction Manual

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Original Instructions
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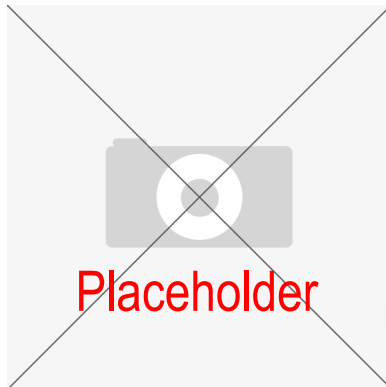
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1 Product Description

Radar-Based Sensors for Detection of Moving and Stationary Targets



- FMCW (true-presence) radar detects moving and stationary objects
- Adjustable sensing field — ignores objects beyond setpoint
- Easy setup and configuration of range, sensitivity, and output with simple DIP switches
- Easy setup and configuration of range, sensitivity, and output using a PC
- Sensing functions are unaffected by wind, falling rain or snow, fog, humidity, air temperatures, or light
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band
- Rugged IP67 housing withstands harsh environments

Protected by US patents.



CAUTION: Make No Modifications to this Product

Any modifications to this product not expressly approved by Banner Engineering could void the user's authority to operate the product. **Contact Banner Engineering for more information.**



WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

1.1 Models

Models	Maximum Range	Beam Angle	Telecom Approval ¹	Output	Connection
Q130RA-9076-AFQ	24 m (78 ft)	90° × 76°	Telecom approved for US, Canada and Brazil	Bipolar NPN/PNP	5-wire 2 m (6.5 ft) Integral cable
Q130RA-2450-AFQ		24° × 50°	Telecom approved for Europe, UK, Australia, New Zealand, China, and Japan	N.O./N.C. Configurable	

1.2 Overview

The R-GAGE sensor emits a well-defined beam of high-frequency radio waves from an internal antenna. Some of this emitted energy reflects back to the receiving antenna. Signal processing electronics in the sensor determine the distance from the sensor to the object based on the time delay of the return signal. The sensor can be configured (using a PC) to sense objects up to a specific distance, ignoring objects beyond this distance (also called background suppression).

¹ For additional countries, contact Banner Engineering.

1.3 Features and Indicators

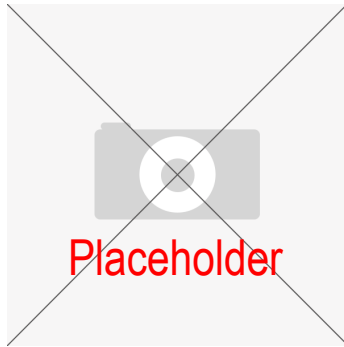


Figure 1. R-GAGE Features

1. Power LED: Green (power ON)
2. Signal Strength LED: Red (flashes in proportion to the signal strength)
3. Output LEDs: Yellow (output energized); Red (configuration)

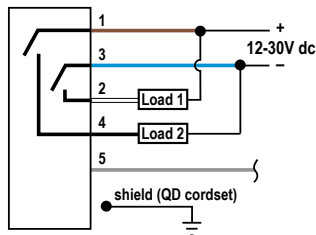
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2 Installation Instructions

2.1 Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

2.2 Wiring



Wiring Key:

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black
- 5 = Gray (Do not connect)

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

3 Specifications

Range

The sensor is able to detect a proper object (see Detectable Objects) from 1 to 24 m (3.3 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

24.050-24.250 GHz, ISM Band

Maximum Output Power

ERP: 3.3 mW, 5 dBm
EIRP: 100 mW, 20 dBm

Supply Voltage

12 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

Bipolar NPN/PNP output, 150mA; DIP switch 6 selects N.O. (default) or N.C. operation

Output Protection

Protected against short circuit conditions

Response Time

DIP switches 7 & 8 select ON/OFF response time

FCC ID: UE3RGAGE1XX—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.

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)
See *Figure 1* on page 4

Construction

Housing: ABS/polycarbonate

Lightpipes: Acrylic

Access Cap: Polyester

Operating Temperature

-40 °C to +65 °C (-40 °F to +149 °F)

Environmental Rating

IEC IP67

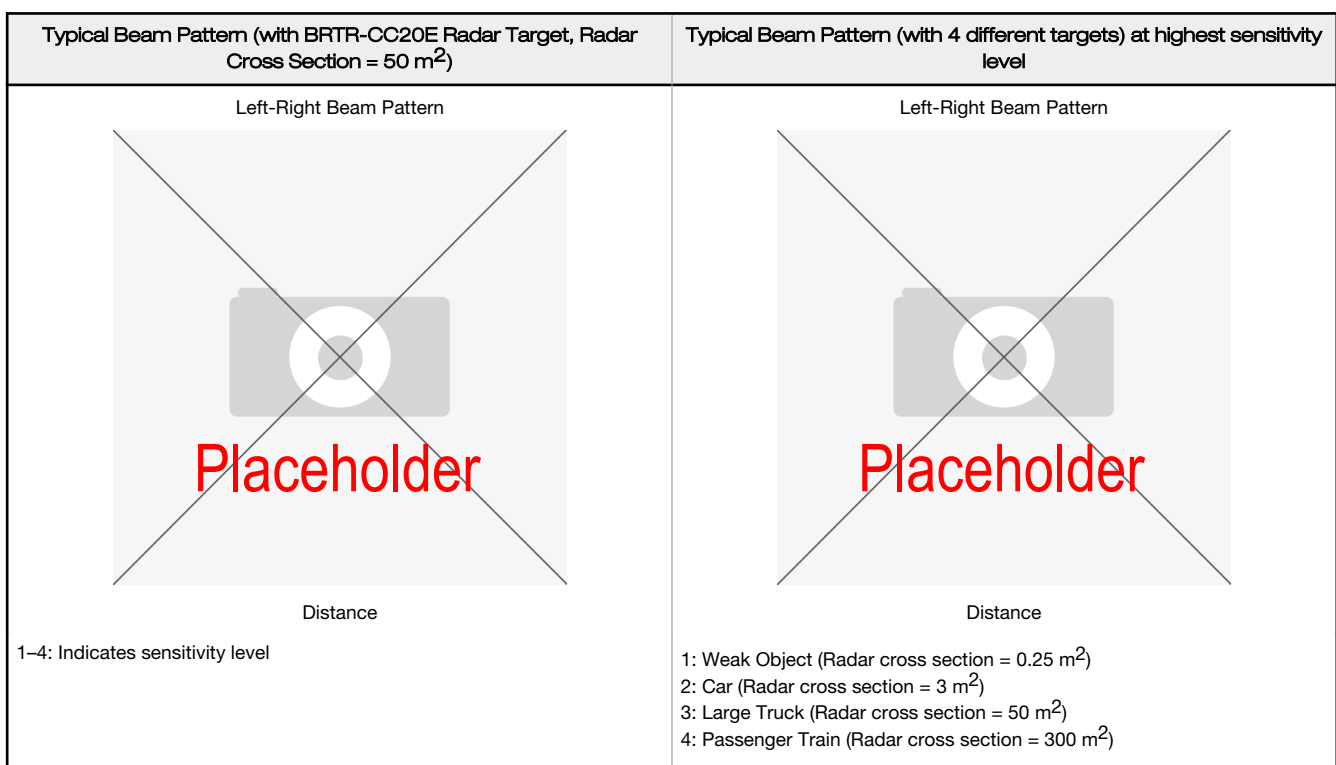
Connections

Integral 5-wire 2 m (6.5 ft) cable or M12 Euro-style QD fitting. QD models require a mating cordset

Certifications



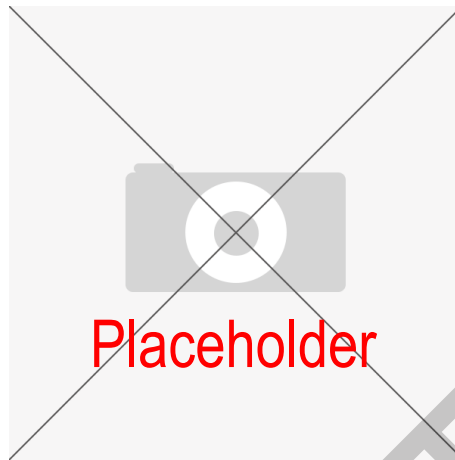
3.1 Beam Patterns



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

3.2 Dimensions

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



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4 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.

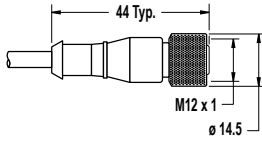
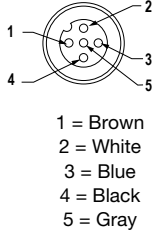
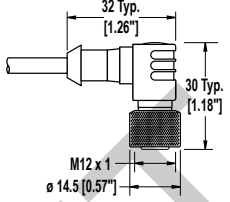
Locate the sensor in a position of minimum reflection from the window, which will repeat every 6.1 mm of distance between the sensor and the window. The positions of maximum reflection from the window repeat between the minimums, and decrease in effect until the window is approximately 150 mm (5.9 in) 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.

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5 Accessories

5.1 Quick Disconnect (QD) Cordsets

5-Pin Threaded M12/Euro-Style Cordsets—with Shield				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		 <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)			
MQDEC2-506RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

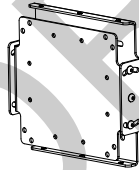


Note: Pin 5 is not used.

5.2 Brackets and Enclosures

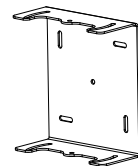
SMBQ240SS1

- Sensor mounting plate and pivoting bracket
- Provides $\pm 20^\circ$ of tilt in one axis for enhanced sensor alignment
- 12 gauge stainless steel
- Sensor can mount on bracket horizontally or vertically



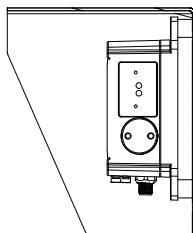
SMBQ240SS2

- Add-on accessory to be used in conjunction with SMBQ240SS1
- Provides $\pm 20^\circ$ of tilt in second axis for maximum control of sensor alignment
- 12 gauge stainless steel



SMBWSQ120

- Rear-Mount Protective Metal Enclosure
- Supports both horizontal and vertical sensor mounting
- Required if the R-GAGE is exposed to rain or snow
- Prevents buildup of water or ice from interfering with sensor performance



6 Banner Engineering Corp. Limited Warranty

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

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