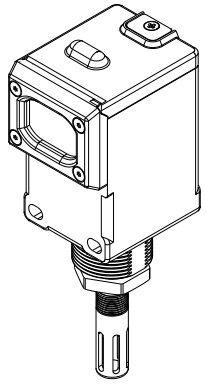
# Q45THA All-in-One Wireless Temperature and Humidity Sensor Node

## Features

Sure Cross® Wireless Q45 Sensors combine the best of Banner's flexible sensor family with its reliable, field-proven, Sure Cross wireless architecture to solve new classes of applications limited only by the user's imagination. Containing a variety of sensor models, a radio, and an internal battery supply, this product line is truly plug-and-play.

The Wireless Q45THA All-in-One Temperature and Humidity Sensor Node combines a temperature and humidity probe with the reliable, field-proven, Sure Cross wireless architecture into one package, eliminating the need for ordering multiple components and reducing the device's physical size. The industrial-grade, battery-powered device can wirelessly transmit temperature and humidity values to a wireless controller or Gateway for remote monitoring of critical systems.



**Benefits**:

- Measures temperature and relative humidity
- Houses the sensor element in a robust case
- Adapter available for compressed air line temperature and humidity monitoring
- No additional sensor wiring
- Ideal for monitoring:
  - Refrigerators or chillers
  - Warehouses
  - Cleanrooms
  - Incubators
  - Storage rooms
  - Distribution Centers

## Quick Start Guide

Continue reading the datasheet for more detailed instructions.

1. Set the DIP switches.
2. Install the battery.
   The radio powers on automatically.
3. Bind the Q45 to its Gateway (DXM Controller or DX80 Performance Gateway) and assign a node ID to the Q45.
4. Mount the Q45.
5. Collect the data with the DXM Controller or Gateway from Input 1 through 3 (relative humidity, temperature °C, and temperature °F, respectively).
6. Scale the data.
   The measured temperature = (Register Data ÷ 20). The relative humidity data does not require scaling.
7. Use the scaled data in the DXM Controller/Gateway to monitor the application, set triggers or alarms, and send data to PLC/HMI/Cloud platform for historical collection and visualization.

## Models

| Model | Radio Frequency | Inputs |
|---|---|---|
| **DX80N9Q45THA** | 900 MHz ISM Band | Temperature and relative humidity (%) |
| **DX80N9Q45THA NB** (ships without a battery) | | |
| **DX80N2Q45THA NB** (ships without a battery) | 2.4 GHz ISM Band | |

The following models are no longer available for order, but are still covered by the information in this document.

| Model | Radio Frequency | Inputs |
|---|---|---|
| **DX80N2Q45THA** | 2.4 GHz ISM Band | Temperature and relative humidity (%) |

## Overview

For the first five minutes after power is applied, the Node operates in fast sample mode, sampling and sending data every two seconds. After five minutes, the Node defaults to five-minute sample intervals. To activate fast sample mode, single-click the binding button. The amber LED is ON solid during the fast sample mode. To exit fast sample mode, click the binding button five times.

Original Instructions
04-Feb-25

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216537
p/n: 216537 Rev. H

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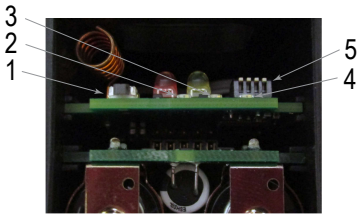
## Storage Mode

While in **storage mode**, the device's radio does not operate to conserve the battery. To put any device into storage mode, press and hold the binding button for five seconds. The device is in storage mode when the LEDs stop blinking. To wake the device, press and hold the binding button (inside the housing on the radio board) for five seconds.

# Configuration Instructions

## Button and LEDs

1. Binding button
2. Red LED (flashing) indicates a radio link error with the Gateway.
3. Green LED (flashing) indicates a good radio link with the Gateway.
4. Amber LED is not used.
5. DIP switches




## DIP Switches

After making any changes to any DIP switch position, reboot the Q45 by triple-clicking the binding button, waiting a second, then double-clicking the binding button.

The DIP switches are in the OFF position, by default. To turn a DIP switch on, push the switch toward the battery pack. DIP switches one through four are numbered from left to right. The factory default sample and report rate is 5 minutes.

| | DIP Switches | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 900 MHz transmit power level: 500 mW (27 dBm) | OFF * | | | | | | | |
| 900 MHz transmit power level: 250 mW (24 dBm), DX80 compatibility mode | ON | | | | | | | |
| Reserved | | OFF * | | | | | | |
| Reserved | | | OFF * | | | | | |
| Reserved | | | | OFF * | | | | |
| Reserved | | | | | OFF * | | | |
| Modbus or software configured (overrides DIP switches) | | | | | | OFF * | OFF * | OFF * |
| Sample/report rate of 15 minutes | | | | | | OFF | OFF | ON |
| Sample/report rate of 5 minutes | | | | | | OFF | ON | OFF |
| Sample/report rate of 64 seconds | | | | | | OFF | ON | ON |
| Reserved | | | | | | ON | OFF | OFF |
| Reserved | | | | | | ON | OFF | ON |
| Reserved | | | | | | ON | ON | OFF |
| Reserved | | | | | | ON | ON | ON |

Refer to the Configuring for Sample on Demand technical note for details on sampling on demand and using a host system.

### Transmit Power Levels

The 900 MHz radios have a high output option that will transmit at 500 mW (27 dBm). The low output option transmits at 250 mW (24 dBm). The 250 mW mode reduces the radio's range but improves the battery life in short-range applications. For 2.4 GHz models, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 65 mW EIRP (18 dBm).

### Sample and Report Rates

The sample interval, or rate, defines how often the Sure Cross device samples the input. For battery-powered applications, setting a slower rate extends the battery life.

The report rate defines how often the Node communicates the I/O status to the Gateway. For battery-powered applications, setting the report rate to a slower rate extends the battery life.


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## Apply Power to the Q45 AA-Cell Models

Follow these instructions to install or replace the lithium "AA" cell batteries.

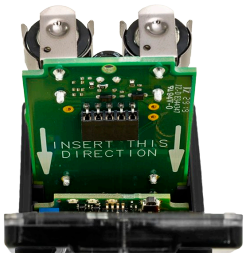
**CAUTION:**

- **As with all batteries, these are fire, explosion, and severe burn hazards. There is a risk of explosion if the battery is replaced incorrectly.**
- Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water.
- Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
- Properly dispose of used batteries according to local regulations by taking them to a hazardous waste collection site, an e-waste disposal center, or another facility qualified to accept lithium batteries.

1. Loosen the clamp plate with a small Phillips screwdriver and lift the cover.
2. Slide the battery board out of the Q45 housing.
3. If applicable, remove the discharged batteries.
4. Install the new batteries.

   Use Banner's **BWA-BATT-006** replacement batteries or equivalent 3.6 V AA lithium batteries, such as Xeno's XL-60F.
5. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
6. Slide the board containing the new batteries back into the Q45 housing.
7. Close the cover and gently tighten the clamp plate with the small Phillips screwdriver.

*Q45 battery board*




## Bind to the Gateway and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices. Separate the devices by two meters when running the binding procedure. Put only one Gateway into binding at a time to prevent binding to the wrong Gateway.

1. On the Gateway: Enter binding mode.
   - For housed DX80 Gateways, triple-click button 2 on the Gateway. Both LEDs flash red.
   - For Gateway board modules, triple-click the button. The green and red LED flashes.
2. Assign the Q45 a Node address using the Gateway's rotary dials. Use the left rotary dial for the left digit and the right rotary dial for the right digit. For example, to assign your Q45 to Node 10, set the Gateway's left dial to 1 and the right dial to 0. Valid Node addresses are 01 through 47.
3. On the Q45: Loosen the clamp plate on the top of the Q45 and lift the cover.
4. Enter binding mode on the Q45 by triple-clicking the Q45's button.
   The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Q45 is bound, the LEDs stay solid momentarily, then they flash together four times. The Q45 exits binding mode.
5. Label the sensor with the Q45's Node address number for future reference.
6. Repeat steps 2 through 5 for as many Q45s as are needed for your network.
7. On the Gateway: After binding all Q45s, exit binding mode.
   - For housed DX80 Gateways, double-click button 2.
   - For board-level DX80 Gateways, double-click the button.

For Gateways with single-line LCDs: After binding your Q45 to the Gateway, make note of the binding code displayed under the Gateway's *DVCFG menu, XADR submenu on the LCD. Knowing the binding code prevents having to re-bind all Q45s if your Gateway is ever replaced.

## Bind to a DXM and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices. Separate the radios by two meters when running the binding procedure. Put only one DXM into binding mode at a time to prevent the Q45 from binding to the wrong Gateway.

1. On the DXM: Use the arrow keys to select the **ISM Radio** menu on the LCD and click **ENTER**.
2. Highlight the **Binding** menu and click **ENTER**.
3. Use the arrow keys to select the Node address to bind the Q45 to.
4. On the Q45: Loosen the top clamp plate and lift the cover.
5. Enter binding mode by triple-clicking the binding button.
   The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Node binds, the LEDs stay solid momentarily, then they flash together four times. The Node exits binding mode.
6. Label the sensor with the Node address number for future reference.
7. On the DXM: Click **BACK** to exit binding for that specific Node address.
8. Repeat steps 3 through 7 and change the Node address for as many Q45s as are needed for your network.
9. On the DXM: After you have finished forming your network, click **BACK** until you reach the main menu.


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## Q45THA Holding Registers

| I/O # | Modbus Holding Register | | I/O Type | I/O Range | | Holding Register Representation | |
|---|---|---|---|---|---|---|---|
| | Gateway | Any Node | | Min. | Max. | Min. | Max. |
| 1 | 1 | 1 + (Node# × 16) | Relative Humidity (%RH) | 0 | 100.00 | 0 | 10000 |
| 2 | 2 | 2 + (Node# × 16) | Temperature °C | –1638.3 | 1638.4 | –32768 | 32767 |
| 3 | 3 | 3 + (Node# × 16) | Temperature °F | –1638.3 | 1638.4 | –32768 | 32767 |
| | | ... | | | | | |
| 7 | 7 | 7 + (Node# × 16) | Reserved | | | | |
| 8 | 8 | 8 + (Node# × 16) | Device Message | | | | |
| | | ... | | | | | |
| 15 | 15 | 15 + (Node# × 16) | Control Message | | | | |
| 16 | 16 | 16 + (Node# × 16) | Reserved | | | | |

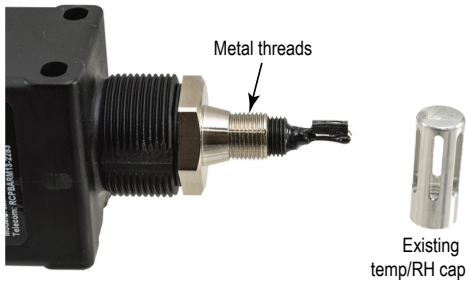
The measured temperature = (Modbus register value) ÷ 20.

# Install the BWA-FTH-001 Adapter

Use the **BWA-FTH-001** NPT adapter to monitor temperature and humidity across compressed air lines with the Q45THA All-in-One Temperature and Humidity Sensor Node. Do not use the adapter and probe assembly to monitor liquid temperature.

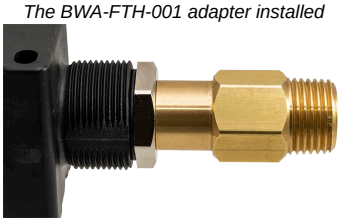
> **IMPORTANT:** Do not contaminate the black threads or any portion of the sensing devices to avoid damaging the probes and giving erroneous measurements. An airtight seal is required between the M12×1 connection of the Q45THA and the NPT adapter to ensure a proper temperature and humidity measurement.

*Installing the BWA-FTH-001 adapter*




1. Remove the existing temperature-humidity cap at the base of the Q45THA Sensor Node.
2. Apply thread sealant to the metal threaded portion of the temperature and humidity sensor.
   Banner recommends using a non-hardening, high-pressure-rated pipe thread sealant such as Rectorseal T PLUS 2 or an equivalent.
3. Carefully thread the BWA-FTH-001 adapter onto the Q45THA Sensor Node.

*The BWA-FTH-001 adapter installed*



# Specifications

## Radio Specifications for Performance Internal Antenna

**Radio Transmit Power (900 MHz, 500 mW radios)**
Conducted: 27 dBm (500 mW)
EIRP with the supplied antenna: < 36 dBm


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**Radio Transmit Power (2.4 GHz radios)**

Conducted: < 18 dBm (65 mW)

EIRP with the supplied antenna: < 20 dBm (100 mW)

**Antenna Minimum Separation Distance**

900 MHz radios transmitting at ≥ 500 mW: 4.57 m (15 ft) with the supplied antenna

2.4 GHz radios transmitting at 65 mW: 0.3 m (1 ft) with the supplied antenna

**Radio Range**

A 2 dB antenna ships with this device.

Transmit power and range are subject to many factors, including antenna gain, installation methods, characteristics of the application, and environmental conditions.

Please refer to the following documents for installation instructions and high-gain antenna options.

Installing Your Sure Cross® Radios (151514)
Conducting a Site Survey (133602)
Sure Cross® Antenna Basics (132113)

**Link Timeout (Performance)**

Gateway: Configurable via User Configuration Software

Node: Defined by Gateway

**Spread Spectrum Technology**

FHSS (Frequency Hopping Spread Spectrum)

**900 MHz Compliance (SX7023EXT Radio Module)**

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX7023EXT

Contains IC: 7044A-SX7023EXT

**2.4 GHz Compliance (SX243 Radio Module)**

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX243

Radio Equipment Directive (RED) 2014/53/EU

Contains IC: 7044A-SX243

## FCC Part 15 Class A for Intentional Radiators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

## Industry Canada Statement for Intentional Radiators

This device contains licence-exempt transmitters(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs/récepteurs exemptés de licence conformes à la norme Innovation, Sciences, et Développement économique Canada. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

# Specifications for the Wireless Q45THA Sensor Node

**Temperature**

Measuring Range: –40 °C to +85 °C (–40 °F to +185 °F)

Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Resolution: 0.1 °C

Accuracy

–40 °C to 0 °C: ± 0.6 °C
0 °C to 60 °C: ± 0.4 °C
+60 °C to +85°C: ± 1.2 °C

**Humidity**

Measuring Range: 0 to 100% relative humidity (RH)

Resolution: 0.1% relative humidity

Accuracy:

±2% at 25 °C
±3% at 0 °C to 70°C and 10–90% RH
± 7% at 0 °C to 70°C and 0–10 % or 90–100 % RH

**Default Sensing Interval**

5 minutes

**Typical Battery Life**

See chart

**Indicators**

Red and green LEDs (radio function)

**Construction**

Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Designed to withstand 1200 psi washdown.

**Certifications**

CE/UKCA approval only applies to 2.4 GHz models

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

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Agência Nacional de Telecomunicações
03737-22-04042

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# Environmental Specifications for the Q45

**Operating Conditions**

–40 °C to +70 °C (–40 °F to +158 °F); 90% at +50 °C maximum relative humidity (non-condensing)

Radiated Immunity: 10 V/m (EN 61000-4-3)

**Environmental Rating**

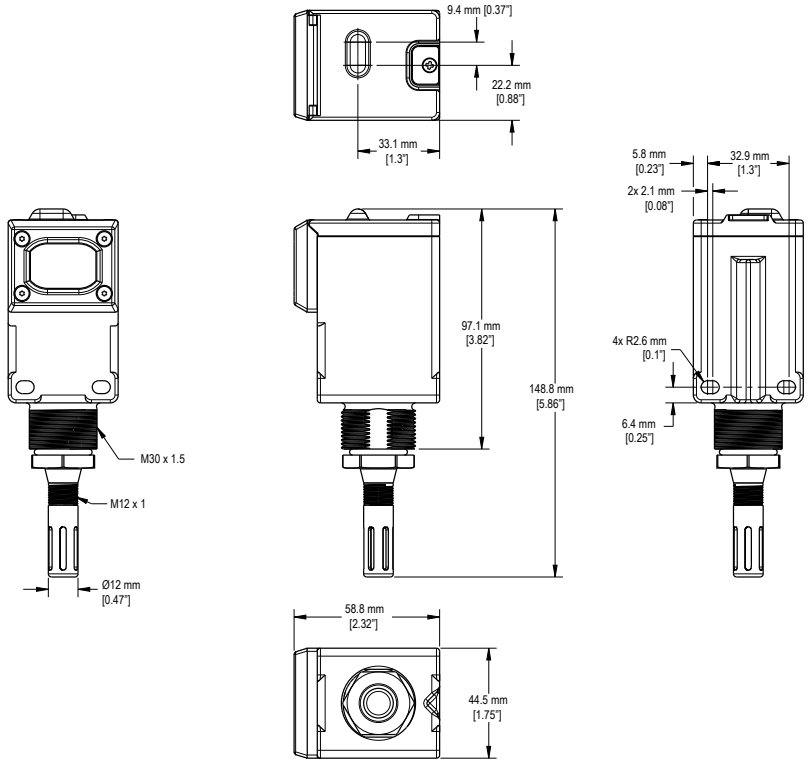
NEMA 6P

IP67

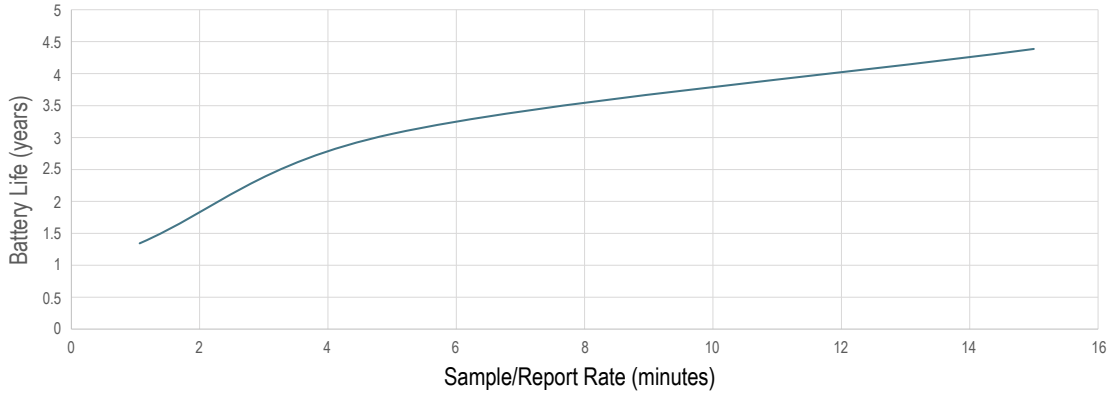
Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

# Q45THA Dimensions

All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.




# Battery Life for the Q45THA





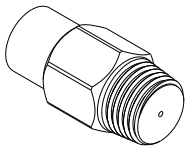
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# Accessories

**BWA-BATT-006**
- 3.6 V Lithium AA cell
- Two batteries



**BWA-FTH-001**
- M12 × 1 mm female to 1/2-inch NPT male adapter
- Brass



# Replacement Batteries (AA Cells)

**BWA-BATT-006**
- 3.6 V Lithium AA cell
- Two batteries



# Temperature-Humidity Filter Caps

**FTH-FIL-001**
- Aluminum grill filter cap
- Factory default, ships with the S15S-TH*Q, M12FT*Q, and Q45 All-in-One sensors



**FTH-FIL-002**
- Stainless steel
- Sintered to 40-micrometer porosity (for high dust environments.)



# Warnings (Internal Antenna Models)

**Exporting Sure Cross® Radios.** It is our intent to fully comply with all national and regional regulations regarding radio frequency emissions. **Customers who want to re-export this product to a country other than that to which it was sold must ensure the device is approved in the destination country.** Consult with Banner Engineering Corp. if the destination country is not on this list.

**IMPORTANT:** Please download the complete Wireless Q45THA All-in-One Temperature and Humidity Sensor Node technical documentation, available in multiple languages, from www.bannerengineering.com for details on the proper use, applications, Warnings, and installation instructions of this device.

**IMPORTANT:** Por favor descargue desde www.bannerengineering.com toda la documentación técnica de los Wireless Q45THA All-in-One Temperature and Humidity Sensor Node, disponibles en múltiples idiomas, para detalles del uso adecuado, aplicaciones, advertencias, y las instrucciones de instalación de estos dispositivos.

**IMPORTANT:** Veuillez télécharger la documentation technique complète des Wireless Q45THA All-in-One Temperature and Humidity Sensor Node sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

**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.

**IMPORTANT:**
- **Electrostatic discharge (ESD) sensitive device**
- ESD can damage the device. Damage from inappropriate handling is not covered by warranty.
- Use proper handling procedures to prevent ESD damage. Proper handling procedures include leaving devices in their anti-static packaging until ready for use; wearing anti-static wrist straps; and assembling units on a grounded, static-dissipative surface.


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

# Notas Adicionales (con Antena)

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

**Approved Antennas**

**BWA-9O2-C**--Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho
**BWA-9O5-C**--Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho
**BWA-9O6-A**--Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra
**BWA-9Y10-A**--Antena, Yagi, 900 MHz, 10 dBd, N Hembra

# Mexican Importer

Banner Engineering de Mèxico, S. de R.L. de C.V. | David Alfaro Siqueiros 103 Piso 2 Valle oriente | San Pedro Garza Garcia Nuevo Leòn, C. P. 66269

81 8363.2714


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