Sure Cross® Temperature and Humidity Sensor

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Datasheet

The Sure Cross® Temperature and Humidity Sensor works in a variety of environments to provide temperature and humidity measurements.

- Manufactured with a robust metal housing
- Functions as a Modbus slave device via RS-485
- Ships with aluminum grill filter cap; optional stainless steel 10 micrometer sintered filter available separately
- 3Q and 4Q models are calibrated and traceable to NIST standards

⚠️ **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.

For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, www.bannerengineering.com.

Configure this sensor using the Sensor Configuration Software and adapter cable BWA-HW-006 (datasheet 140377).

Models

Models	Accuracy	Calibration[1]	I/O
M12FTH3Q	±2% at 25 °C	Yes	Temperature and relative humidity via RS-485 Modbus
M12FT3Q	±2% at 25 °C	Yes	Temperature via RS-485 Modbus

Banner Humidity Sensor Calibration Statement. This calibration statement (also available online) lists the chain with which the calibration of Banner humidity sensors is traceable to NIST standards. A Certificate of Factory Calibration ships with every 3Q and 4Q model sensor. Although your certificate will be specific to your product, a sample certificate is available for download.

Configuration Instructions

Sensor Configuration Software

The Sensor Configuration Software offers an easy way to manage sensor parameters, retrieve data, and visually show sensor data from a number of different sensors. The Sensor Configuration Software runs on any Windows machine and uses an adapter cable to connect the sensor to your computer.

Download the most recent version of the software from Banner Engineering's website: www.bannerengineering.com and select **Software** from the **Products** drop-down list.

The Sensor Configuration Software currently supports the following sensors:

Sensor Type	Model	USB Adapter Cable
Temperature and Humidity	M12FTH3Q and M12FT3Q	USB-to-RS-485 adapter cable model **BWA-HW-006** OR USB to RS-485 adapter cable model **BWA-UCT-900** (datasheet p/n 140377)
	M12FTH4Q and M12FT4Q	USB-to-RS-232 1-Wire adapter cable model **BWA-USB1WIRE-001** (datasheet p/n 170020)
Vibration and Temperature	QM42VT1	USB-to-RS-232 1-Wire adapter cable model **BWA-USB1WIRE-001** (datasheet p/n 170020)
	QM42VT2	USB-to-RS-485 adapter cable model **BWA-HW-006** OR USB to RS-485 adapter cable model **BWA-UCT-900** (datasheet p/n 140377). When updating the firmware, you must use one of the two USB to RS-485 adapter cables plus a splitter pigtail cable p/n 83265.
	QM30VT1	USB-to-RS-232 1-Wire adapter cable model **BWA-USB1WIRE-001** (datasheet p/n 170020)
	QM30VT2	USB to RS-485 adapter cable model **BWA-UCT-900** (datasheet p/n 140377). When updating the firmware, you must use one of the two USB to RS-485 adapter cables.

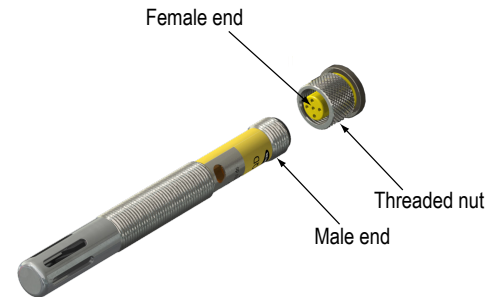[1] 3Q and 4Q models are calibrated and traceable to NIST standards

Sensor Type	Model	USB Adapter Cable
GPS	GPS50M	USB-to-RS-485 adapter cable model **BWA-HW-006** AND a field-wireable M12/Euro-style connector or connecter with pigtail OR USB to RS-485 adapter cable model **BWA-UCT-900** AND a field-wireable M12/Euro-style connector or connecter with pigtail (datasheet p/n 140377)
U-GAGE K50U Ultrasonic	K50UX1CRA	USB-to-RS-232 1-Wire adapter cable model **BWA-USB1WIRE-001** (datasheet p/n 170020)
	K50UX2CRA	USB-to-RS-485 adapter cable model **BWA-HW-006** OR USB to RS-485 adapter cable model **BWA-UCT-900** (datasheet p/n 140377)
	K50UX1ARA	USB-to-RS-232 1-Wire adapter cable model **BWA-USB1WIRE-001** (datasheet p/n 170020)
	K50UX2ARA	USB-to-RS-485 adapter cable model **BWA-HW-006** OR USB to RS-485 adapter cable model **BWA-UCT-900** (datasheet p/n 140377)

Refer to the Sensor Configuration Software Instruction Manual (p/n 170002) to update your sensor's firmware.

Connect the Temperature/Humidity Sensor

To install the sensor to a device with a 5-pin Euro-style female end:

1. Align the notch in the female connector with the key in the sensor's male connector.
2. Gently slide the sensor end into the connector.
3. Rotate the threaded nut to tighten the sensor down. DO NOT attempt to rotate the sensor after it is connected to the device or the cable end because this will damage the sensor.

Wiring

5-pin M12/Euro-style Male Connector	Pin	Wire Color	Sensor Connection
	1	Brown	Power IN (+). Either 3.6–5.5 V DC (Low Power Mode) or 12–24 V DC
	2	White	RS485 / D1 / B / +
	3	Blue	Ground (-)
	4	Black	RS485 / D0 / A / –
	5	Gray	For 12–24 V DC operation: Not Used For 3.6–5.5 V DC operation: Discrete NPN Select Line. Pull to ground to enable serial communications; release from ground to disable serial communications

Refer to the Class I Division 2 control drawings (p/n 143086) for wiring specifications and limitations.

Low Power Mode operation (3.6–5.5 V DC operating voltage) offers the user savings in power consumption by putting the Banner Temperature and Humidity Sensor's serial communications to sleep whenever the sensor is deselected. Low Power Mode operation is ideal for battery-powered applications or any application with power consumption restrictions. When the sensor is deselected, power consumption drops to 45 µA. When the sensor is selected, power consumption is 4 mA.

To operate the Banner Temperature and Humidity Sensor in Low Power Mode, the supply voltage applied to Power In must be within the range of 3.6–5.5 V DC. Set the Select Line to 0 V (ground) to select the sensor and activate the sensor's serial communications. Release the Select Line from 0 V (ground) to deselect the sensor and disable the sensor's serial communications. When deselected, the sensor's green LED continues to blink normally. To bypass Low Power Mode, connect the Select Line to ground (0 V).

For example, to use Low Power Mode, use 3.6 V DC battery power and connect the Select Line to Discrete Output 1 (NMOS output, low active).

Modbus Registers

Humidity measurements are only available on the **M12FTH3Q** model. A humidity sensor is not included with the **M12FT3Q** model.

		I/O Range		Holding Register Representation	
Sensor Address	Description	Min Value	Max Value	Min (Dec)	Max (Dec)
40001	Humidity (%RH)	0	100.00%	0	10,000

Sensor Address	Description	I/O Range		Holding Register Representation	
		Min Value	Max Value	Min (Dec)	Max (Dec)
40002	Temperature (°C)	−1638.4	1638.3	−32768	32767
40003	Temperature (°F)	−1638.4	1638.3	−32768	32767
46101	Baud	0=9.6k, 1=19.2k (default), 2=38.4k			
46102	Parity	0=none (default), 1=odd, 2=even			
46103	Modbus slave address	1 (default) through 247			

The temperature = (Modbus register value) ÷ 20. The humidity = (Holding register value) ÷ 100.

Specifications

Supply Voltage
12 to 24 V DC OR 3.6 to 5.5 V DC low power option

Current
Default sensing: 45 µAmps
Disabled sensing: 32 µAmps
Active comms: 4 mA

Discrete Input
One, NPN/Sinking
Rating: 3 mA max current at 30 V DC
Sample Rate: 125 milliseconds
ON Condition (NPN): Less than 0.7 V
OFF Condition (NPN): Greater than 2 V or open

Temperature
Measuring Range: −40 °C to +85 °C (−40 °F to +185 °F) [2]
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
Operating the Modbus temperature/humidity sensor at voltages greater than 12 V can increase the temperature accuracy error by up to 1 °C. The amount of error depends upon the application's device mounting and air flow characteristics.

Environmental Rating
IEC IP67; NEMA 6

Operating Temperature
−40 °C to +85 °C (−40 °F to +185 °F)

Shock and Vibration
All models meet IEC 60068-2-6 and IEC 60068-2-27 testing criteria
Shock: 30G 11 ms duration, half sine wave per IEC 60068-2-27
Vibration: 10 Hz to 55 Hz, 0.5 mm peak-to-peak amplitude per IEC 60068-2-6

Mounting Threads
M12 × 1

Indicators
Green flashing: Power ON
Red flicker: Serial Tx

Temperature and/or Humidity Input
Sample Rate: 16 seconds

Communication
Interface: RS-485 serial
Baud rates: 9.6k, 19.2k (default), or 38.4k
Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)
Do not use termination resistor.
Protocol: Modbus RTU

Humidity
Humidity measurements are only available with model M12FTH3Q. Model M12FT3Q does not include the humidity sensor.
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

Certifications for the 3Q Models

CSA: Class I, Division 2, Groups A, B, C, D — Certificate 1921239

Refer to the Class I Division 2 control drawings (p/n 143086) for wiring specifications and limitations. All battery-powered devices must only use the lithium battery manufactured by Xeno, model XL-205F (Banner model number **BWA-BATT-001**).

Accessories

Temperature-Humidity Filter Caps

FTH-FIL-001
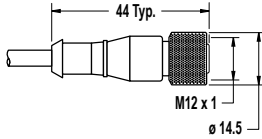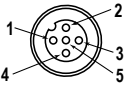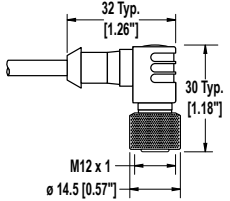- Aluminum grill filter cap (factory default, ships with M12FT*Q sensors)

FTH-FIL-002
- Stainless steel, sintered to 10 micrometer porosity (for high dust environments.)

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

5-Pin Euro-Style Cordsets

5-Pin Threaded M12/Euro-Style Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC1-501.5	0.50 m (1.5 ft)	Straight	44 Typ. · M12 x 1 · ø 14.5	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-506	2 m (6.5 ft)			
MQDC1-515	5 m (16.4 ft)			
MQDC1-530	9 m (29.5 ft)			
MQDC1-506RA	2 m (6.5 ft)	Right-Angle	32 Typ. [1.26"] · 30 Typ. [1.18"] · M12 x 1 · ø 14.5 [0.57"]	
MQDC1-515RA	5 m (16.4 ft)			
MQDC1-530RA	9 m (29.5 ft)			

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