

# Sure Cross<sup>®</sup> Temperature and Humidity Sensor



## Datasheet

The SureCross Temperature and Temperature/Humidity Sensor works in a variety of environments to provide temperature and humidity measurements.



- Manufactured with a robust metal housing
- Connects via a 1-wire serial interface
- Designed to work with *FlexPower* 1-Wire Serial Interface Node models DX80N9X1S-P6 and DX80N2X1S-P6, the 10 to 30 V dc powered 1-Wire Serial Interface Node models DX80N9X6S-P6 and DX80N2X6S-P6, MultiHop M-H6 and M-H6L radios, and the Wireless Q45 Sensor Nodes DX80N2Q45TH and DX80N9Q45TH
- Ships with aluminum grill filter cap; optional stainless steel 10 micrometer sintered filter available separately



### 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.

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, [www.bannerengineering.com/surecross](http://www.bannerengineering.com/surecross).

Model	Power Requirements	I/O
M12FTH4Q	3.6 to 5.5 V dc	Temperature and relative humidity via a 1-wire serial interface
M12FT4Q		Temperature via a 1-wire serial interface

Configure this sensor using the [Sensor Configuration Tool](#) and adapter cable BWA-USB1WIRE-001 (datasheet [170020](#)).

[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 temperature/humidity or temperature sensor. Although your certificate will be specific to your product, a sample certificate is available for [download](#).

## Sensor Configuration Tool

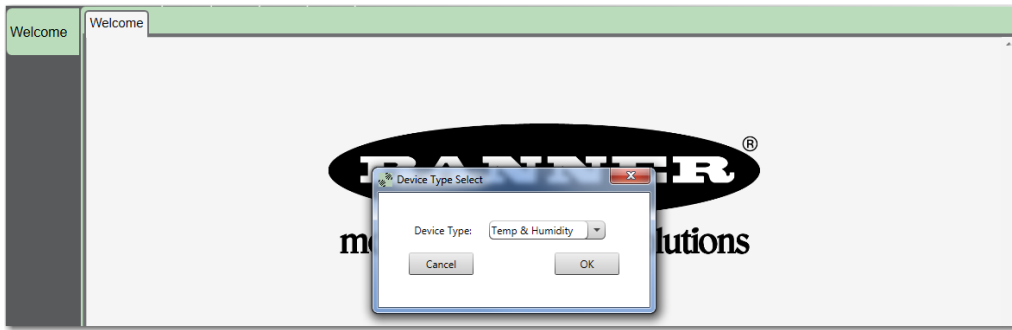
The Sensor Configuration Tool offers an easy way to manage sensor parameters, retrieve data, and visually show sensor data from a number of different sensors. The Sensor Configuration Tool software runs on any Windows machine and uses an adapter cable to connect the sensor to your computer.

Download the most recent version of the Sensor Configuration Tool from Banner Engineering's website: [www.bannerengineering.com/wireless](http://www.bannerengineering.com/wireless). The Sensor Configuration Tool currently supports the following sensors:

Sensor Type	Model	USB Adapter Cable
Temperature and Humidity	M12FTH3Q and M12FT3Q	Model BWA-HW-006: USB-to-RS-485 adapter cable
	M12FTH4Q and M12FT4Q	Model BWA-USB1WIRE-001: USB-to-RS-232 1-Wire adapter cable
Vibration and Temperature	QM42VT1	Model BWA-USB1WIRE-001: USB-to-RS-232 1-Wire adapter cable
	QM42VT2	Model BWA-HW-006: USB-to-RS-485 adapter cable
GPS	GPS50M	Model BWA-HW-006: USB-to-RS-485 adapter cable AND a field-wireable M12/Euro-style connector or connector with pigtail
U-GAGE K50U Ultrasonic	K50UX2RA	Model BWA-USB1WIRE-001: USB-to-RS-232 1-Wire adapter cable

Launch the Sensor Configuration Tool and from the drop-down list, select your sensor type and click OK.

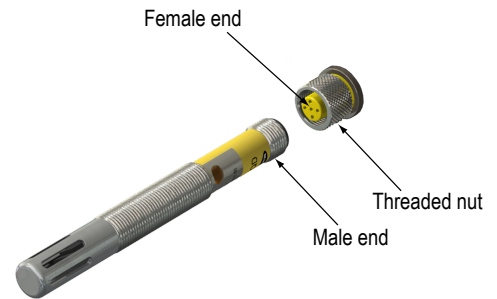




## Connecting the Temperature/Humidity Sensor

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

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

This sensor is designed to be plugged directly into compatible Nodes. The Node powers the sensor and periodically requests data using the 1-wire serial interface.

5-pin M12/Euro-style Connector (Male)	Pin	Wire Color	Sensor Connection
	1	Brown	Power IN (+), 3.6 to 5.5 V dc
	2	White	1-Wire serial device select (sinking input to sensing device)
	3	Blue	Ground (-)
	4	Black	Not used/reserved
	5	Gray	1-Wire serial communications

## Holding Registers

The temperature = (Holding register value) ÷ 20.

Sensor Register	Output Type	I/O Range		Holding Register Representation	
		Min	Max	Min (Dec)	Max (Dec)
1	Humidity (%RH) <sup>1</sup>	0	100.00%	0	10,000
2	Temperature (°C)	-1638.4	1638.3	-32768	32767
3	Temperature (°F)	-1638.4	1638.3	-32768	32767

<sup>1</sup> Only available on the M12FT4Q model. Humidity sensor is not included with the M12FT4Q model.

## Specifications

### Supply Voltage

3.6 to 5.5 V dc

### Current

Default sensing: 28 µAmps  
 Disabled sensing: 15 µAmps  
 Active comms: 4.7 mA

### Mounting Threads

M12 × 1

### Indicators

Green flashing: Power ON  
 Red flicker: Serial Tx

### Communication Hardware

Interface: 1-wire serial interface  
 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)

### Communication Protocol

Sure Cross DX80 Sensor Node 1-Wire Serial Interface

### Communications Line

Level Receive ON: Greater than 2 V  
 Level Receive OFF: Less than 0.7 V  
 Level Transmit ON: 2.7 to 3 V  
 Level Transmit OFF: 0 V (pulldown resistor of 10 kOhm)

### Compatible Nodes

#### 900 MHz Models

DX80N9X1S-P6  
 DX80N9X6S-P6  
 DX80DR9M-H6 and -H6L  
 DX80N9Q45TH

#### 2.4 GHz Models

DX80N2X1S-P6  
 DX80N2X6S-P6  
 DX80DR2M-H6 and -H6L  
 DX80N2Q45TH

### Humidity

Humidity measurements are only available with the M12FTH4Q model. The M12FT4Q model does not include the humidity sensor.  
 Measuring Range: 0 to 100% relative humidity  
 Resolution: 0.1% relative humidity  
 Accuracy: ±2% relative humidity at 25 °C

### Temperature

Measuring Range: -40 °C to +85 °C (-40 °F to +185 °F)  
 Resolution: 0.1 °C  
 Accuracy: ±0.3 °C at 25 °C

### Environmental Rating

IEC IP67; NEMA 6



### Operating Temperature

-40 °C to +85 °C (-40 °F to +185 °F) <sup>2</sup>

### Shock and Vibration

IEC 68-2-6 and IEC 68-2-27  
 Shock: 30g, 11 millisecond half sine wave, 18 shocks  
 Vibration: 0.5 mm p-p, 10 to 60 Hz

## Replacement Filters

Replacement Filters	Description	
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.)	

## Euro-Style Cordsets - Double Ended

When using the FlexPower Node with integrated battery, use a double ended cordset. When using a FlexPower Node with external power supply, use a single ended cordset. If using the communication lines, the cable length cannot exceed 3 meters (10 ft).

<sup>2</sup> Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

5-Pin Threaded M12/Euro-Style Cordsets—Double Ended and Less Than 3 m Long				
Model	Length	Style	Dimensions	Pinout
DEE2R-51D	0.31 m (1 ft)	Female Straight/ Male Straight		Male
DEE2R-53D	0.91 m (3 ft)			Female
DEE2R-58D	2.44 m (8 ft)			

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# Sure Cross® Temperature and Humidity Sensor



## 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



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Models	Power Requirements	I/O
M12FTH3Q	3.6 to 5.5 V dc low power option or 12 to 24 V dc	Temperature and relative humidity via RS-485 Modbus
M12FT3Q		Temperature via RS-485 Modbus

Configure this sensor using the [Sensor Configuration Tool](#) and adapter cable BWA-HW-006 (datasheet [140377](#)).

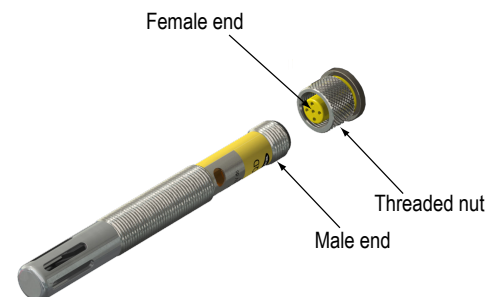
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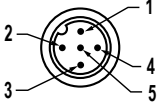
## Connecting the Temperature/Humidity Sensor

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

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

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

Sensor Address	Description	I/O Range		Holding Register Representation	
		Min Value	Max Value	Min (Dec)	Max (Dec)
40001	Humidity (%RH) <sup>1</sup>	0	100.00%	0	10,000
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.

## 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

<sup>1</sup> Only available on the M12FTH3Q model. Humidity sensor is not included with the M12FT3Q model.

**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 and/or Humidity Input**  
 Sample Rate: 16 seconds

**Humidity<sup>2</sup>**

Measuring Range: 0 to 100% relative humidity  
 Resolution: 0.1% relative humidity  
 Accuracy: ±2% relative humidity at 25 °C

**Temperature**

Measuring Range: -40 °C to +85 °C (-40 °F to +185 °F)<sup>3</sup>  
 Resolution: 0.1 °C  
 Accuracy: ±0.3 °C at 25 °C  
 Running the sensor at higher voltages can induce internal heating that can decrease accuracy.

**Environmental Rating**  
 IEC IP67; NEMA 6

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



**Shock and Vibration**  
 IEC 68-2-6 and IEC 68-2-27  
 Shock: 30g, 11 millisecond half sine wave, 18 shocks  
 Vibration: 0.5 mm p-p, 10 to 60 Hz

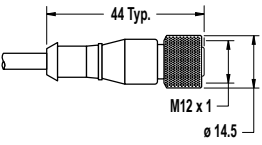
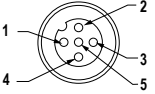
**Mounting Threads**  
 M12 x 1

**Indicators**  
 Green flashing: Power ON  
 Red flicker: Serial Tx

**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

## Accessories

Replacement Filters	Description	
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.)	

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		 <p>1 = Brown                  2 = White                  3 = Blue                  4 = Black                  5 = Gray</p>
MQDC1-506	1.83 m (6 ft)			
MQDC1-515	4.57 m (15 ft)			
MQDC1-530	9.14 m (30 ft)			
MQDC1-506RA	1.83 m (6 ft)	Right-Angle		
MQDC1-515RA	4.57 m (15 ft)			
MQDC1-530RA	9.14 m (30 ft)			

<sup>2</sup> Humidity measurements are only available with model M12FTH3Q. Model M12FT3Q does not include the humidity sensor.  
<sup>3</sup> Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

## Banner Engineering Corp. Limited Warranty

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