Sure Cross® Vibration and Temperature Sensor

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Datasheet

The Sure Cross® Vibration and Temperature Sensor works in a variety of machines to identify and predict failures in rotating machinery.

- Detects dual-axis vibration
- Provides high accuracy vibration and temperature measurements
- Manufactured with a robust zinc alloy housing
- Connects via a 1-wire serial interface
- Designed to work with *Flex*Power 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 Wireless Q45 Sensor Nodes DX80N2Q45VT and DX80N9Q45VT

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

⚠️ 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.

Models

Model	Power Requirements	I/O
QM42VT1	3.6 to 5.5 V dc	Vibration and temperature using a 1-wire serial interface

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

ISO 10816 provides guidance for evaluating vibration velocity severity motors, pumps, fans, compressors, gear boxes, blowers, dryers, presses, and other machines that operate in the 10 to 1000 Hz frequency range.

Machine		Class I Small Machines	Class II Medium Machines	Class III Large Rigid Foundation	Class IV Large Soft Foundation
in/s	mm/s				
0.01	0.28				
0.02	0.45				
0.03	0.71		good		
0.04	1.12				
0.07	1.80				
0.11	2.80		satisfactory		
0.18	4.50				
0.28	7.10		unsatisfactory		
0.44	11.2				
0.70	18.0				
1.10	28.0		unacceptable		
1.77	45.9				

Vibration Velocity Vrms

*Figure 1. Vibration Severity per ISO 10816*

Installation Instructions
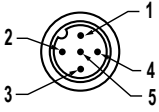
Connecting the Vibration/Temperature Sensor

To install the sensor to a device with a 5-pin M12/Euro-style female connector:

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.
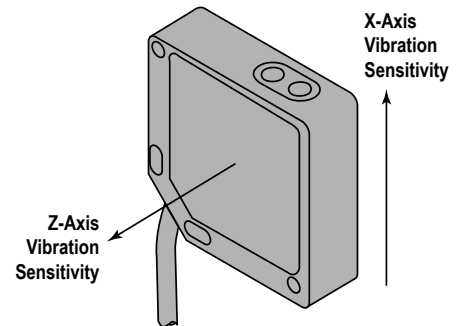
Wiring

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

| 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

Configuration Instructions

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*. 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 connecter with pigtail
U-GAGE K50U Ultrasonic	K50UX1RA	Model BWA-USB1WIRE-001: USB-to-RS-232 1-Wire adapter cable
	K50UX2RA	Model BWA-HW-006: USB-to-RS-485 adapter cable

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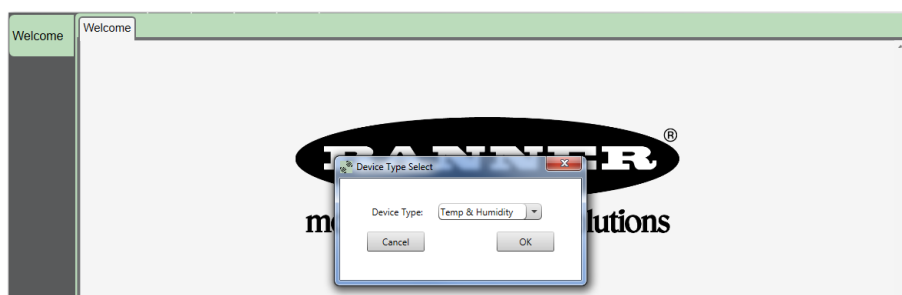
Holding Registers

By default, data is supplied to the Node every two and a half minutes, unless the Node requests the data sooner. Use the Sensor Configuration Tool to adjust the sensor's sample rate if a different value is needed. The default configuration is shown.

Sensor Register	Output Type *	I/O Range		Holding Register Representation	
		Min	Max	Min (Dec)	Max (Dec)
1	Z-Axis RMS Velocity (in/sec) [1, 5]	0	6.5535	0	65535
2	Z-Axis RMS Velocity (mm/sec) [2, 5]	0	65.535	0	65535
3	Temperature (°F) [3]	−1638.4	1638.3	−16384	16383
4	Temperature (°C) [3]	−1638.4	1638.3	−16384	16383
5	X-Axis RMS Velocity (in/sec) [1, 5]	0	6.5535	0	65535
6	X-Axis RMS Velocity (mm/sec) [2, 5]	0	65.535	0	65535

* The sensor register output data types are user configurable. Use the Sensor Configuration Tool to change the output types. All optional output types are listed below.

[1] Value = Register value ÷ 10000
[2] Value = Register value ÷ 1000
[3] Value = Register value ÷ 20
[4] Value = Register value ÷ 10
[5] Measurement bandwidth = 10 Hz to 1 kHz
[6] Measurement bandwidth = 1 kHz to 4 kHz

Optional Output Types

Optional Output Types	I/O Range		Holding Register Representation	
	Min	Max	Min (dec)	Max (dec)
Z-Axis Peak Acceleration (G) [2, 6]	0	65.535	0	65535
X-Axis Peak Acceleration (G) [2, 6]	0	65.535	0	65535
Z-Axis Peak Velocity Component Frequency (Hz) [4, 5]	0	6553.5	0	65535
X-Axis Peak Velocity Component Frequency (Hz) [4, 5]	0	6553.5	0	65535
Z-Axis RMS Acceleration (G) [2, 5]	0	65.535	0	65535
X-Axis RMS Acceleration (G) [2, 5]	0	65.535	0	65535
Z-Axis Kurtosis [2, 6]	0	65.535	0	65535
X-Axis Kurtosis [2, 6]	0	65.535	0	65535
Z-Axis Crest Factor [2, 6]	0	65.535	0	65535
X-Axis Crest Factor [2, 6]	0	65.535	0	65535
Z-Axis Peak Velocity (in/sec) [1, 5]	0	6.5535	0	65535
Z-Axis Peak Velocity (mm/sec) [2, 5]	0	65.535	0	65535
X-Axis Peak Velocity (in/sec) [1, 5]	0	6.5535	0	65535
X-Axis Peak Velocity (mm/sec) [2, 5]	0	65.535	0	65535
Z-Axis High-Frequency RMS Acceleration (G) [2, 6]	0	65.535	0	65535
X-Axis High-Frequency RMS Acceleration (G) [2, 6]	0	65.535	0	65535

[1] Value = Register value ÷ 10000
[2] Value = Register value ÷ 1000
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[4] Value = Register value ÷ 10
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[6] Measurement bandwidth = 1 kHz to 4 kHz

Specifications

Supply Voltage
3.6 to 5.5 V dc

Current
Default sensing: 197 µA
Disabled sensing: 95 µA
Active comms: 3.1 mA

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	2.4 GHz Models
DX80N9X1S-P6	DX80N2X1S-P6
DX80N9X6S-P6	DX80N2X6S-P6
DX80DR9M-H6 and -H6L	DX80DR2M-H6 and -H6L
DX80N9Q45VT	DX80N2Q45VT

Certifications

CE

Vibration Sensor
Mounted base resonance: 4.5 kHz nominal
Measuring Range: 0 to 46 mm/sec or 0 to 1.8 in/sec RMS
Frequency Range: 10 Hz to 4 kHz
Accuracy: ±10% at 25 °C

Connector
3 meter cable with 5-pin M12 fitting

Indicators
Green flashing: Power ON
Amber flicker: Serial Tx

Temperature Sensor
Measuring Range: −40 °C to +105 °C (−40 °F to +221 °F)
Resolution: 1 °C
Accuracy: ± 3 °C

Environmental Rating
NEMA 6P, IEC IP67

Operating Temperature
−40 °C to +105 °C (−40 °F to +221 °F)[1]

Shock
400G

Mounting Options
The VT1 sensor can be mounted using a variety of methods, including 1/4"-28 hex screw, epoxy, thermal tape, or magnetic mount.

Performance P6 Node Battery Life
900 MHz 1 Watt default configuration: 2.5 years
900 MHz 250 mW default configuration: 3.4 years
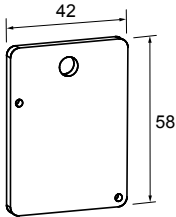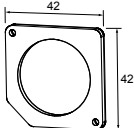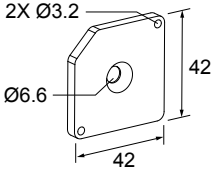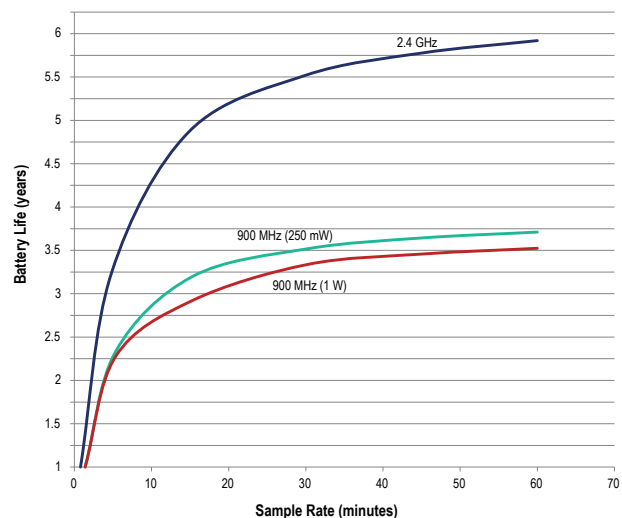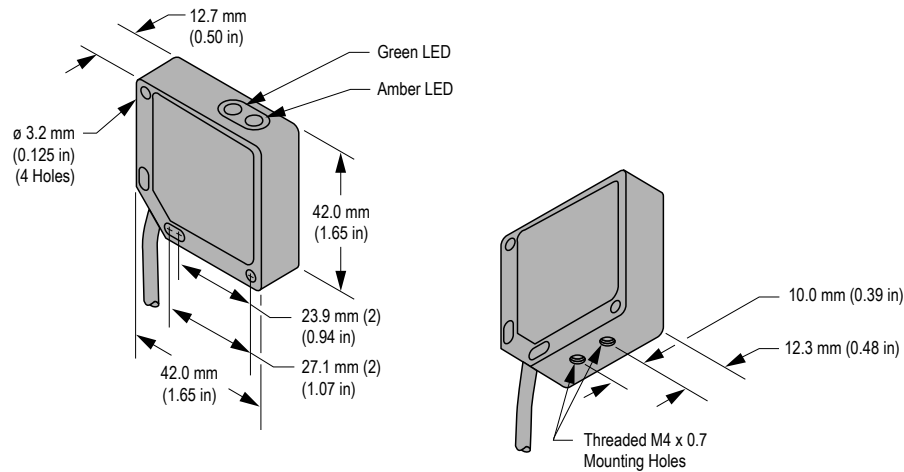2.4 GHz default configuration: 4.3 years

Figure 2. Battery Life of a Wireless Q45VT Node Connected to a QM42VT1 Sensor

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

Dimensions

- 12.7 mm (0.50 in)
- Green LED
- Amber LED
- ø 3.2 mm (0.125 in) (4 Holes)
- 42.0 mm (1.65 in)
- 23.9 mm (2) (0.94 in)
- 27.1 mm (2) (1.07 in)
- 42.0 mm (1.65 in)
- 10.0 mm (0.39 in)
- 12.3 mm (0.48 in)
- Threaded M4 x 0.7 Mounting Holes

Accessories for the Vibration and Temperature Sensor

Included with Sensor	Available for Order
BWA-BK-002 • Includes SMB42FL stainless steel bracket, 1/4"-28 screw mount, and 1 piece of 3M™ thermally conductive adhesive transfer tape *(42, 58)*	**BWA-BK-001** • Includes magnetic mounting bracket SMB42FLM12 and 2 mounting screws *(42, 42)*
BWA-HW-057 • 3M™ Thermally Conductive Adhesive Transfer Tape 8820 • Provides a heat-transfer path between heat-generating components and heat sinks or other cooling devices • 3 pieces per pack • Tape is 20 mils (0.50 mm) thick; liner is 1.5-2 mil (37.5-50 µm) thick • Thermally conductive ceramic filler • Dual liner using silicone-treated polyester: easy-release PET liner is clear, tight side PET liner is blue	**BWA-USB1WIRE-001** • PC USB to 1-wire serial interface converter • Use with the Sensor Configuration Tool software to communicate directly with 1-wire serial interface sensors • Refer to datasheet *170020* for more information about wiring the adapter cable to this sensor
	BWA-BK-005 • Use when measuring high frequency vibrations or when mounting the sensor to curved surfaces • Includes SMB42FLAT stainless steel bracket, 1/4"-28 screw mount, and 1 piece of 3M™ thermally conductive adhesive transfer tape *(2X Ø3.2, Ø6.6, 42, 42)*

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