Sure Cross® Wireless Q45 Sensor Node - Vibration/Temperature

Datasheet

Sure Cross® Wireless Q45 Sensors combine the best of Banner's flexible Q45 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 internal battery supply, this product line is truly plug and play.

The Sure Cross Vibration and Temperature Sensor works on a variety of machines to provide vibration and temperature measurements to effectively monitor and predict when maintenance of critical equipment is required.

The Wireless Q45 Vibration and Temperature Sensor Node:

- Provides high accuracy vibration and temperature measurements
- Achieves vibration accuracy of ± 10% RMS velocity (in/sec) and temperature accuracy of ± 3 °C
- Houses the sensor element in a robust zinc alloy case
- Includes a red/amber LED that provides local visual indication of a change in machine conditions, similar to a "check engine" light

Available Models

- DX80N9Q45VT - Must be paired with QM42VT1 Vibration and Temperature Sensor (sold 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.

General Operation

For the first 15 minutes after power up, the Node samples the sensor every two seconds (fast sample mode). After 15 minutes, the Node defaults to 5 minute sample intervals. Activate fast sample mode by single clicking the button (the amber LED is solid).

- The amber LED on the front of the Q45 Node flashes when the vibration threshold limit set in I/O 1 is met. To minimize false vibration triggering, two consecutive samples must be above the threshold before the output condition is satisfied.
- The red LED on the front of the Q45 Node flashes when the temperature threshold limit set in I/O 4 is met. Only one reading above the established threshold is required to trigger this alert.

Set the vibration thresholds using the DIP switches or using the UCT to define the Threshold parameter. The DIP switch vibration thresholds were determined using the guidance of Vibration Severity per ISO 10816.

The default setting for the temperature threshold is 80 °C. Change the temperature threshold using the User Configuration Tool (UCT) software and defining the Threshold parameter.

- Class I: Small (up to 15 kW) machines and subassemblies of larger machines.
- Class II: Medium size (15 kW to 75 kW) machines without special foundations, or machines up to 300 kW rigidly mounted on special foundations.
- Class III: Large rotating machines rigidly mounted on foundations which are stiff in the direction of vibration measurement.
- Class IV: Large rotating machines mounted on foundations which are flexible in the direction of vibration measurement.

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.

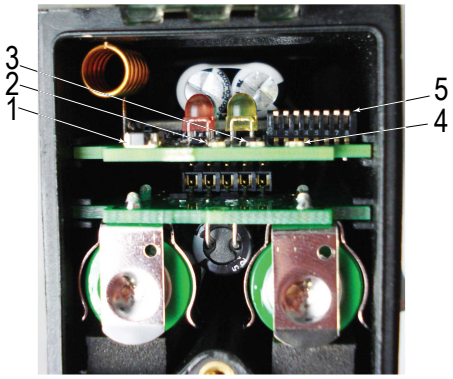
Machine			Class I Small Machines	Class II Medium Machines	Class III Large Rigid Foundation	Class IV Large Soft Foundation
Vibration Velocity Vrms	in/s	mm/s				
	0.01	0.28				
	0.02	0.45				
	0.03	0.71		good		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		satisfactory		
	0.18	4.50				
	0.28	7.10		unsatisfactory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

Figure 1. Vibration Severity per ISO 10816

Storage Mode for the Q45

While in storage mode, the Q45's radio does not operate. The Q45 ships from the factory in storage mode to conserve the battery. To wake the device, press and hold the button for five seconds. To put any Q45 into storage mode, press and hold the button for five seconds. The Q45 is in storage mode when the LEDs stop blinking.

Button, LEDs, and DIP Switches



1. 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 (flashing) indicates fast sample mode.
5. DIP Switches

DIP Switch Settings

After making any changes to any DIP switch position, reboot the Wireless Q45 Sensor by triple-clicking the button, waiting a second, then double-clicking the button. As shown in the image above, the DIP switches are in the OFF position. To turn a DIP switch on, push the switch toward the battery pack. DIP switches one through four are numbered from left to right.

Description	DIP Switches							
	1	2	3	4	5	6	7	8
Transmit power: 1 Watt (30 dBm)	OFF *							
Transmit power: 250 mW (24 dBm) (DX80 compatibility mode)	ON							
RESERVED		OFF *	OFF *	OFF *				
Vibration alarm at 0.15 in/sec (default setting)					ON	OFF	OFF	OFF
Vibration alarm at 0.25 in/sec					ON	OFF	OFF	ON

Description	DIP Switches							
	1	2	3	4	5	6	7	8
Vibration alarm at 0.35 in/sec					ON	OFF	ON	OFF
Vibration alarm at 0.55 in/sec					ON	OFF	ON	ON
Local light mapping disabled					OFF *			
UCT configurable						ON	ON	OFF

* default setting

Bind the Q45 to the Gateway and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices.

1. Enter binding mode on the Gateway.
   - For single-button models, triple-click the button.
   - For two-button models, triple-click button 2.

   On the board modules, the green and red LED flashes. On the housed Gateway models, both LEDs flash red.
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 01, set the left dial to 0 and the right dial to 1.

   Valid Node addresses are 01 through 47.
3. 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 button. For the opposed mode sensor, the button is on the receiver.
   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 and place the sticker on the Q45.
6. Repeat steps 2 through 5 for as many Q45 as are needed for your network.
7. After binding all Q45, exit binding mode on the Gateway.
   - For single-button models, double-click the button.
   - For two-button models, double-click button 2.

For Gateways with 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.

Modbus Register Table

The temperature = (Holding register value) ÷ 20.

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)	Input 1: Z-Axis RMS Velocity (in/sec)	0	6.5535	0	65535
2	2	2 + (Node# × 16)	Input 2: Z-Axis RMS Velocity (mm/sec)	0	65.535	0	65535
3	3	3 + (Node# × 16)	Input 3: Temperature (°F)	–1638.4	1638.3	–32768	32767
4	4	4 + (Node# × 16)	Input 4: Temperature (°C)	–1638.4	1638.3	–32768	32767
5	5	5 + (Node# × 16)	Input 5: X-Axis RMS Velocity (in/sec)	0	6.5535	0	65535
6	6	6 + (Node# × 16)	Input 6: X-Axis RMS Velocity (mm/sec)	0	65.535	0	65535
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				
9	9	9 + (Node# × 16)	Discrete OUT 1: Red Light [1]	0	1	0	1
10	10	10 + (Node# × 16)	Discrete OUT 2: Yellow Light [1]	0	1	0	1
11	11	11 + (Node# × 16)	Discrete OUT 3: Green Light [1]	0	1	0	1
12	12	12 + (Node# × 16)	Discrete OUT 4: Blue Light [1]	0	1	0	1

[1] Not available when the vibration/temperature sensor is used with the P6 Node.

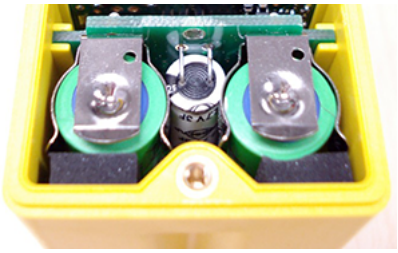
I/O #	Modbus Holding Register		I/O Type *	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min.	Max.
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

* These are the default data types that output from the QM42VT1 serial sensor, corresponding to inputs 1 through 6 of the Q45 Node. If necessary, configure the QM42VT1 output data types using the Sensor Configuration Tool and adapter cable BWA-USB1WIRE-001 (datasheet *170020*). Refer to the QM42VT1 datasheet (p/n *186209*) for optional output data types with their corresponding I/O ranges and holding register representations.

Replacing the Batteries

To replace the lithium "AA" cell battery, follow these steps.

As with all batteries, these are a fire, explosion, and severe burn hazard. Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water. Properly dispose of used batteries according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries.



1. Lift the plastic cover.
2. Slide the board containing the batteries out of the Q45 housing.
3. Remove the discharged batteries and replace with new batteries. Use two 3.6 V AA lithium batteries, such as Xeno's XL-60F or equivalent.
4. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.
5. Slide the board containing the new batteries back into the Q45 housing.

Replacement battery model number: BWA-BATT-006. For pricing and availability, contact Banner Engineering.

Specifications

Radio Range
Up to 3.2 km (2 miles)[2]

Minimum Separation Distance
4.57 m (15 feet)

Transmit Power
1 Watt (25 dBm) Conducted

Default Sensing Interval
5 minutes

Indicators
Red and green LEDs (radio function)

Connection
One 5-pin threaded M12/Euro-style female quick disconnect

Construction
Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown.

900 MHz Compliance (1 Watt)
FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

Typical Battery Life
See chart

Environmental Rating
NEMA 6P, IEC IP67

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

[2] Range depends on the environment and decreases significantly without line of sight. Always verify your wireless network's range by performing a Site Survey.

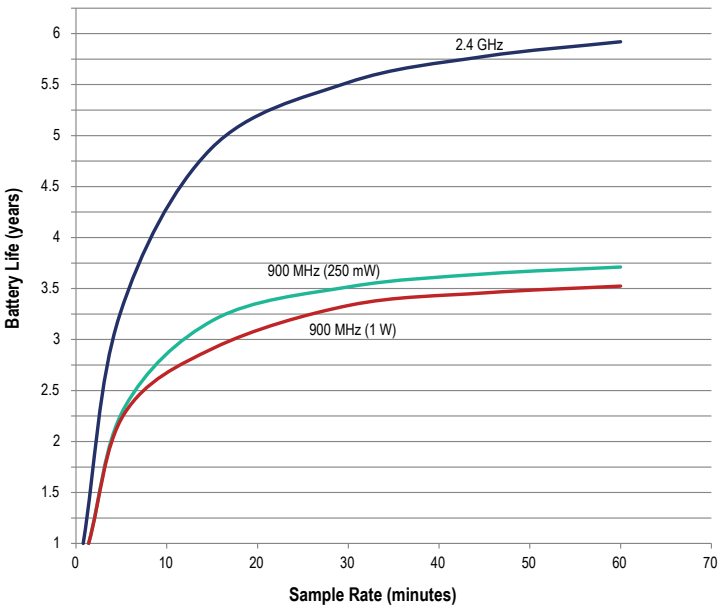


Figure 2. Battery Life of a Wireless Q45VT Node Connected to a QM42VT1 Sensor

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