

BeanDevice® WILLOW® AX-3D

ULP (ULTRA-LOW-POWER) WIRELESS IOT VIBRATION SENSOR

PRODUCT VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



STEP FILE



MQTT TOOLKET FOR IOT  
SENSOR

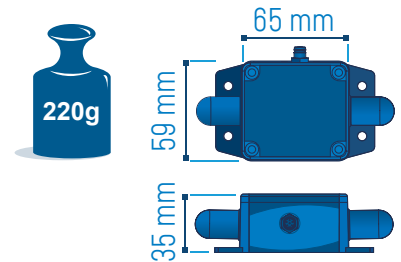


2year  
Warranty

MADE IN GERMANY

CE FC [E] R 001A-08148

WiFi  
CERTIFIED



MAIN FEATURES

- ULP (Ultra Low Power) Wifi technology
- Embedded data logger: up to 5 million data points (with events dating)
- High precision accelerometer (measurement range  $\pm 2g$  or  $\pm 10g$ ) with FFT, PPV (Peak-Particle Velocity) and Amplitude calculations
- Waterproof (IP67/NEMA 6) and Rugged aluminum casing,
- Over the Air Firmware upgrade via WIFI
- Virtual Inclinometer
- USB 2.0 link for device configuration (including firmware upgrade)
- Store and Forward+: lossless data transmission
- Excellent radio link relying on the radio antenna diversity designed by Beanair®
- IOT Ready: integrates MQTT data exchange, an open-source Internet of Things (IOT) protocol
- Smart and Flexible power supply :
  - Internal Rechargeable Lithium Battery (780 mAh)
  - External 5VDC power supply compatible with both USB power and solar energy harvesting

APPLICATIONS

Test and Measurement



Structural Health Monitoring



Ground Vibration Monitoring



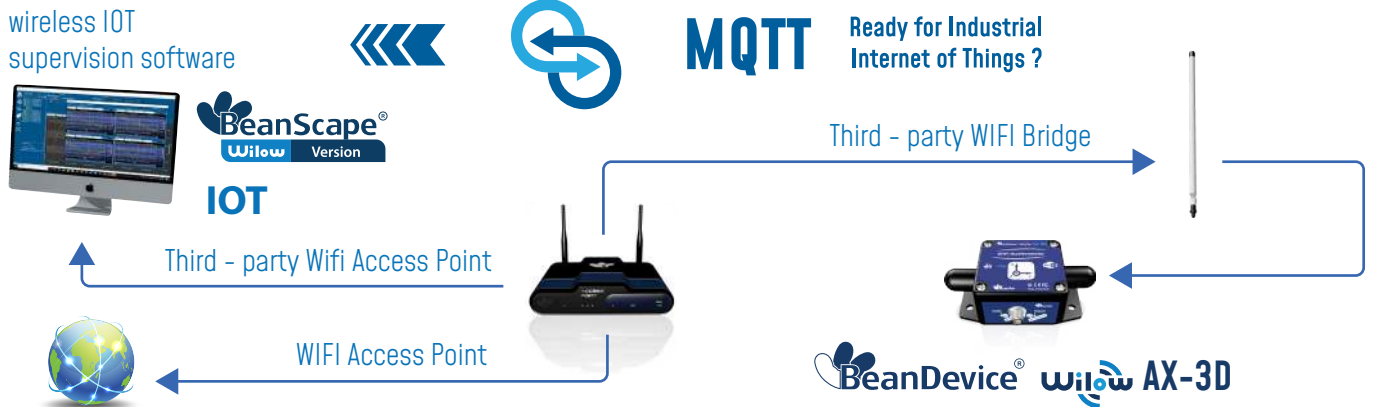
AN OPEN-STANDARD & INDUSTRIAL WIFI TECHNOLOGY

- ULP (Ultra Low power) Wifi – IEEE 802.11 b/g/n
- Lower total cost of ownership-works with existing access points
- Large installed base and consequent broad-based familiarity with configuration, use and troubleshooting at the physical and link layers
- Easy provisioning & IT friendly: our ULP wifi sensors use IP-over-Ethernet networking environment



**BeanDevice® WILLOW® AX-3D**

**MQTT | OPEN-STANDARD INTERNET OF THINGS PROTOCOL.**



**EHR-AUXILIARY POWER SUPPLY COMPATIBLE WITH SOLAR ENERGY HARVESTING 8-24VDC**



**A RELIABLE WIFI TECHNOLOGY THANKS TO OUR "STORE AND FORWARD+" FUNCTION**



The store and forward technique works by storing the message transmitted by the **BeanDevice® Wilow** (wireless DAQ/sensor) to a Wifi access point/ Wifi receiver. If the message is not received due to a network disruption, it will be retransmitted on the next transmission cycle. This technique allows to bring a lossless data transmission.

User can also enable the Hard real-time option; i.e. the message must be received by the Wifi Access Point/Wifi Receiver within the confines of a stringent deadline. It is automatically deleted if it failed to reach its destination within the allotted time span

**TECHNICAL SPECIFICATIONS**

**PRODUCT REFERENCE**

**BND-WILOW-WIFI-AX3D-MR-MO-EXPWR**

<b>MR - Measurement Range:</b>	<b>MO - Mounting option</b>	<b>EXPWR -Auxiliary External Power supply</b>
2G: ±2g measurement range	BR - 90° Mounting bracket	
10G: ±10g measurement range	M - Magnetic Mounting	EHR - Power supply compatible with solar energy harvesting 8-24VDC

**Example 1: BND-WILOW-WIFI-AX3D-10G-BR**

ULP WIFI accelerometer with ±10g range with 90° Mounting bracket

**Example 2: BND-WILOW-WIFI-AX3D-2G-M**

ULP WIFI accelerometer with ±2g range with magnetic mounting

**Example 3: BND-WILOW-WIFI-AX3D-10G-EHR**

ULP WIFI accelerometer with ±10g range, with auxiliary external Power supply compatible with Energy Harvesting 8-24VDC

**MAIN ACCELEROMETER SPECIFICATIONS**

Accelerometer technology	High precision accelerometer based on MEMS technology
measurement range	two versions: ±2g and ±10g
Sensitivity	±2g Version : 660 mV/g ±10g version: 200 mV/g
Typical non-linearity	±0.1% FS
Analog to Digital converter	24-bit delta-sigma with temperature compensation Synchronous measurement channel
Sensor frequency response (-3 dB)	DC to 800 Hz
Maximum sampling rate	2 kSPS per axis
Noise spectral density	±2g Version : 45 µg/√Hz ±10g version: 100 µg/√Hz
Zero-g Offset Variation from RT over Temp	±2g Version : ±0.2 mg/°C ±10g version: ±0.1 mg/°C
Sensitivity Variation from RT over Temp	±2g Version : ±0.01 %/°C (XY), ±0.02 %/°C (Z) ±10g version: ±0.01 %/°C
Offset Ratiometric Error	±2g Version : 4mg ±10g version: ±0.2% (XY), ±0.1% (Z)
Sensitivity Ratiometric Error	±2g Version : ±1.25 % (X-Y), ±0.2 % (Z) ±10g Version : ±1.6% (X-Y), ±0.2 % (Z)
Cross Axis Sensitivity	0.02
Onboard temperature sensor	Range -40°C to +65°C, accuracy ±1°C
Anti-aliasing Hardware filter	Butterworth 2th order filter
Calibration	Factory calibrated with calibration settings backed up on the sensor Flash memory. Calibration method used : Back-to-back calibrated with a reference sensor. Sensors can be re-calibrated by the user.

**ADVANCED VIBRATION ANALYSIS TOOL (AVAILABLE ON BEANSCAPE® WILOW® PREMIUM AND RA)**

Software Filter	<ul style="list-style-type: none"> <li>• Low-Pass Infinite Impulse Response Filter (IIR)</li> </ul>
Fast Fourier Transform (FFT)	<ul style="list-style-type: none"> <li>• Online and Offline FFT</li> <li>• FFT Window Type ( offline FFT only): Recangular/Hamming/Hann/Blackman/Blackman Harris/ Gaussian/Kaiser/Taylor/Triangular/Flattop/Bartlett Hann</li> <li>• Automatic FFT Report (Email Transmission)</li> <li>• Configurable Number of FFT points, 128 to 32768 points</li> </ul>
Peak Particle de Velocity (PPV)	<p>Available only on the BeanDevice® Wilow® AX-3D with ±2g of range:</p> <ul style="list-style-type: none"> <li>• PPV Log file (Email Transmission)</li> <li>• Automatic DIN4150-3 report (Email Transmission)</li> </ul>
Displacement measurement	<p>Available only on the BeanDevice® Wilow® AX-3D with ±2g of range</p>

**REMOTE CONFIGURATION PARAMETERS**

Data Acquisition mode (SPS = sample per second)	<ul style="list-style-type: none"> <li>• Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hour</li> <li>• Alarm -Low duty cycle: 1s to 24 hour</li> <li>• Streaming mode : 100 SPS by default</li> <li>• Streaming with event-trigger (SET) Mode : 100 SPS by default</li> </ul>
Sampling Rate (in streaming mode)	<p>Minimum: 1 SPS per axis Maximum: 2 kSPS per axis</p>
Alarm Threshold	High and Low Levels alarms
Power Mode	Battery Saver & Active power modes

**RF SPECIFICATIONS**

Wireless Protocol Stack	IEEE 802.11 b/g/n
WSN Topology	Point-to-Point / Star / Cluster-Tree
Crypto Engine	WPA2, WPS2
Data rate	UDP: 16 Mbps TCP: 13 Mbps
RF Characteristics	ISM 2.4GHz. Antenna diversity designed by Beanair®
TX Power	18 dBm @ 1 DSSS 14.5 dBm @ 54 OFDM
Rx Sensitivity	-95.7 dBm @1 DSSS -74.0 dBm @54 OFDM
Maximum Radio Range	200m (L.O.S), Radio range be extended by adding Wifi Bridge/Repeater
Antenna	Antenna diversity : 2 omnidirectional antenna with a gain of 2.8 dBi
OTA	Over the air firmware upgrade via WIFI


**BeanDevice® WILOW® AX-3D**

### USB SPECIFICATIONS

USB standard	USB 2.0
Data Rate	Full speed operation(12MB/s)
Related functions	<ul style="list-style-type: none"> <li>• Firmware update</li> <li>• Wifi &amp; system configuration</li> </ul>

### EMBEDDED DATA LOGGER

Storage Capacity	up to 5 million data points
Wireless data downloading	3 minutes to download the full memory (average time)

### ENVIRONMENTAL AND MECHANICAL

Casing	Aluminum casing Dimensions in mm (LxWxH):35x59x65 mm without antenna & eyelet, Weight (with internal battery, w/o mounting option) : 220g
IP   NEMA Rating	IP67   Nema 6
Shock resistance	100g during 50 ms
Operating Temperature	-40 °C to +65 °C
Norms & Radio Certifications	<ul style="list-style-type: none"> <li>• CE Labelling Directive R&amp;TTE (Radio) ETSI EN 300 328(Europe)</li> <li>• FCC (North America)</li> <li>• ARIB STD-T66 Ver. 3.6 (Japan)</li> <li>• ROHS - Directive 2002/95/EC</li> </ul>

### POWER SUPPLY

Rechargeable battery	High density Lithium-Ion rechargeable battery with a capacity of 900 mAh
Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery monitoring
Battery Life	see Battery life table herefater and battery life simulation toolkit available on our website
External power supply	<ul style="list-style-type: none"> <li>• USB Power supply 5V</li> <li>• Optional auxiliary external Power Supply: 8VDC to 24VDC compatible with solar energy harvesting</li> </ul>

### INCLUDED ACCESSORIES

M8 plastic cap	1pcs, <a href="#">Ref: WL-PC</a>
M8 to USB cable	1pcs M8-6pins to USB Cable, 2 meters length. <a href="#">Ref: WL-CBL-M8-6P-USB-2M</a>
Magnet for power on/power off	1pcs Magnet. <a href="#">Ref: WL-MGN</a>
Wall mounting kit	4 pcs M5 screws+ Locknut. <a href="#">Ref: WL-WIFI-SCMKIT</a>



**OPTIONAL ACCESSORIES AND SERVICES**

Power-supply	Wall plug-in, Switchmode power Supply 12V @ 1,25A with USB plug. Provided with power adapter: North America/Japan/China or Europe or UK or Australia <a href="#">REF: WL-USB-5V-PWR</a>
M8 Cable	M8-6Pins Cable, Waterproof ( IP67) and shielded cable , cable length : • 2 meters. <a href="#">Ref: WL-CBL-M8-6P-2M</a> • 5 meters. <a href="#">Ref: WL-CBL-M8-6P-5M</a>
WIFI AP / Repeater / Bridge (wifi link extension)	Wireless AP/Repeater with an integrated N-Type RF connector + High Gain Antenna Wifi Access Point/Bridge/Repeater Integrated N-Type RF connector + High Gain Antenna with 9 dBd of Gain. Casing : Outdoor UV Stabilized Plastic, Dimensions (w/o antenna): 190 x 46 mm, Weight: 196 g Antenna Connector: N-Type Connector (male), Power over Ethernet power supply (24VDC) Max. Power Consumption: 6 Watts , Operating Temperature: -40 to 80° C Shock and Vibration: ETSI300-019-1.4 Included: 1 x AC to 24VDC POE Power supply 1 x High Gain Antenna 9dBi 1 x Power adapter (EU or UK or US) <a href="#">Ref: WL-AP-UBIQ-TIT-7DBI for 7dBi Antenna</a> <a href="#">Ref: WL-AP-UBIQ-TIT-9DBI for 9dBi Antenna</a>
Standalone solar power system	High efficiency solar panel with Solar charging controller and Lead-acid battery <a href="#">Ref.: X-SOL-7AH-20W-5V-5M</a> for USB power <a href="#">Ref.: X-SOL-7AH-20W-12V-5M</a> for -EHR VERSION <a href="#">Ref: X-SOL-14AH-20W-4CH-5V-5M</a> for USB power <a href="#">Ref: X-SOL-14AH-20W-4CH-12V-5M</a> for -EHR VERSION <a href="#">Ref: X-SOL-14AH-80W-4CH-5V-5M</a> for USB power <a href="#">Ref: X-SOL-14AH-80W-4CH-12V-5M</a> for -EHR VERSION More options and references are available on X-SOLAR datasheet

**OPTIONAL ACCESSORIES AND SERVICES**

Solar Panel	Polycrystalline Solar Panel for BeanDevice® Wilow® power supply Maximum Power : 5W , Optimum operating Voltage: 12 VDC Protection Frame: Aluminum Frame , Waterproof IP67 The 3W solar panel works only with LowDutyCycle & Survey/Alarm data acquisition with battery saver mode enabled The 5W solar panel works only with LowDutyCycle, Survey/Alarm & streaming burst data acquisition with battery saver mode enabled Country of origin: solar panel from China, assembled and tested in Germany <a href="#">REF: WL-SLP-5W-2M ,5W</a> Solar panel with 2 meters of cable length <a href="#">REF: WL-SLP-5W-5M ,5W</a> Solar panel with 5 meters of cable length
Calibration certificate	Calibration certificate provided by Beanair GmbH A static calibration method is used on a granite surface plate DIN876 <a href="#">Ref: WL-CERT-CAL</a>

**Conditions: Battery saver mode enabled , Temperature 25degC, BeanDevice listening to new config every 18h**

Battery Saver mode Enabled, Measurement Cycle every minute  
 Battery Saver mode Enabled, Measurement Cycle every 5 minutes  
 Battery Saver mode Enabled, Measurement Cycle every hour

**Battery Life with Slow Measurement Rate (LDCDA) Internal LiPO Battery**

40 days  
 72 days  
 88 days

**Conditions: Battery saver mode enabled , Temperature 25degC, BeanDevice listening to new config every 18h**

Battery Saver mode Enabled, Measurement Cycle 20s to 1 measurement per day

**Battery Life with Slow Measurement Rate (LDCDA) External 5W Solar Panel (REF: WL-SLP-5W-2M) EHR Option**

>= 3 years (depends on battery cycle life)

**Conditions: Battery saver mode enabled Temperature 25degC**

Wakes up every 2 hours, Sample at 200Hz during 20s  
 Wakes up every 1 hour, Sample at 500Hz during 20s  
 Wakes up every 20 minutes, Sample at 200Hz during 20s

**Battery Life with Fast Measurement Rate (Streaming Burst)- Internal Battery**

54 days  
 34.5 days  
 18 days

**Conditions: Battery saver mode enabled Temperature 25degC**

All timing combinatios related to streaming burst option

**Battery Life with Fast Measurement Rate (Streaming Burst)- with X-SOLAR-7AH or X-SOLAR-14AH**

>= 3 years (depends on battery cycle life)

**Conditions: 25degC**

Sampling Rate 2000Hz  
 Sampling Rate 1000Hz  
 Sampling Rate 100Hz

**Battery Life with Fast Measurement Rate (Continuous Streaming)- Internal Battery**

11hours 52 minutes  
 13hours 41 minutes  
 19hours 46 minutes

**Conditions: 25degC**

Sampling Rate 10Hz to 2000Hz

**Internal Battery Life with Fast Measurement Rate (Continuous Streaming)-with X-SOLAR-7AH or X-SOLAR-14AH**

>= 3 years (depends on battery cycle life)



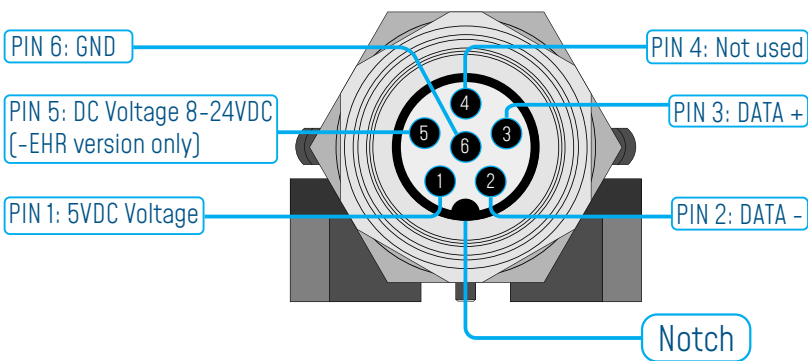
**BeanDevice® WILOW® AX-3D**

**BEANDEVICE® WILOW® FRONT VIEW**



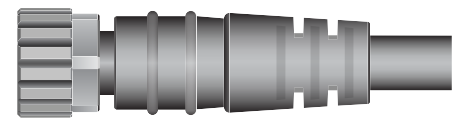
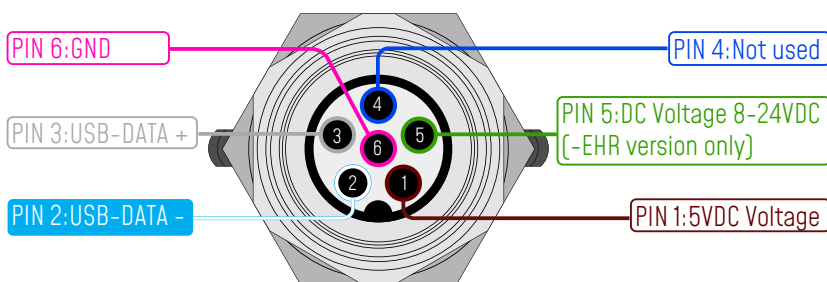
**EXTERNAL POWER SUPPLY WIRING CODE**

**M8-6Pins socket [ Male, A-Coding] - PIN ASSIGNATION**



Interface Name	M8 Pin assignment
5VDC Voltage	PIN 1
DATA -	PIN 2
DATA +	PIN 3
Not used	PIN 4
DC Voltage 8-24VDC [-EHR version only]	PIN 5
GND	PIN 6

**M8-6Pins Plug [ Female, A-Coding] - PIN ASSIGNATION**



M8-6Pins Plug

Interface Name	5VDC Voltage	USB DATA -	USB DATA +	Not used	DC Voltage 8-24VDC [-EHR version only]	GND
M8 Pin assignment	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6
Wire Color [A-coding]	BROWN	WHITE	GREY	BLUE	GREEN	PINK

**BeanDevice® WILOW® AX-3D**

**MECHANICAL MOUNTING OPTIONS**

By default, the **BeanDevice® Wilow®** comes with a screw mounting lid.

Two other mounting options are available:

- Magnetic mounting, add the extension -M on your product reference
- 90° bracket, add the extension -BR on your product reference



Mechanical Mounting Options Video



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