

BeanDevice® WILOW® X-INC

ULP (ULTRA-LOW-POWER) WIFI IOT COMBO SENSORS (VIBRATION AND INCLINATION) WITH BUILT-IN DATA LOGGER

FEATURED VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



STEP FILE



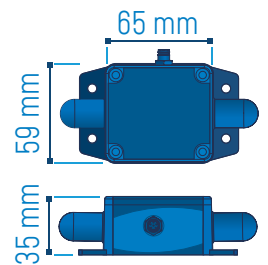
MQTT TOOLKIT FOR IOT SENSOR



MADE IN GERMANY



001A-08148



MAIN FEATURES

- ULP (Ultra Low Power) Wifi technology
- First wireless combo sensors on the market integrating accelerometer/inclinometer/shock sensors
- High precision bi-axis inclinometer  $\pm 15^\circ$  or  $\pm 30^\circ$  with great measurement repeatability ( $\pm 0.003^\circ$  on full Scale for  $\pm 15B$  version).
- Waterproof (IP67/NEMA 6) and Rugged aluminum casing,
- High accuracy bi-axis inclinometer  $\pm 15^\circ$  or  $\pm 30^\circ$
- Embedded data logger: up to 5 million data points (with events dating)
- Over the Air Firmware Upgrade via WIFI
- USB 2.0 link for device configuration (including firmware upgrade)
- Store and Forward+: lossless data transmission
- IIOT Ready: integrates MQTT data exchange, an open-source Internet of Things (IOT) protocol
- Excellent radio link relying on the radio antenna diversity developed by Beanair®
- 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



Structural Health Monitoring



Land Surveying

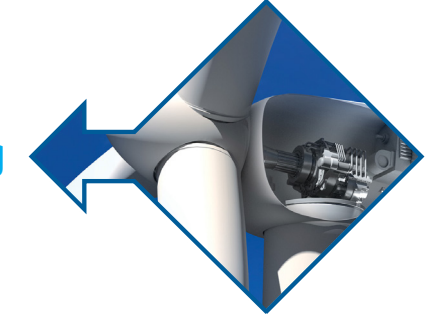
Ground Vibration Monitoring



Test and Measurement



Condition 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® X-INC**

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

wireless IOT supervision software



**BeanScope®**  
Wilow Version  
**IOT**



**MQTT**

Ready for Industrial Internet of Things ?

Third - party WIFI Bridge

Third - party Wifi Access Point

WIFI Access Point

**BeanDevice® wilow X-INC**

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



5V USB

OR

Third - party WIFI Bridge



**BeanDevice®**  
**wilow X-INC**



Third - party Wifi Access Point



**BeanScope®**  
Wilow Version

wireless IOT supervision software

**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 X-INC** 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-X-INC-ACCMR-INCMR-MO-EXPWR

|                              |                            |                           |  |
|------------------------------|----------------------------|---------------------------|--|
| ACCMR – Measurement Range:   | INCMR - Measurement Range: | MO - Mounting option      | EXPWR -Auxiliary External Power supply                             |
| 2G : ±2g measurement range   | 15B : bi-axis ±15°         | BR - 90° Mounting bracket |  |
| 10G : ±10g measurement range | 30B : bi-axis ±30°         | M - Magnetic Mounting     | EHR - Power supply compatible with solar energy harvesting 8-24VDC |

**Example 1:** BND-WILOW-WIFI-2G-15B-BR - ULP Wifi Combo sensors accelerometer (measurement range ±2g) and Inclinator (measurement range ±15° Bi-axis) with 90° bracket mounting

**Example 2:** BND-WILOW-WIFI-10G-30B-M - ULP Wifi Combo sensors accelerometer (measurement range ±10g) and Inclinator (measurement range ±30° Bi-axis) with magnet mounting

**Example 3:** BND-WILOW-WIFI-2G-15B-EHR - ULP Wifi Combo sensors accelerometer (measurement range ±2g) and Inclinator (measurement range ±15° Bi-axis) , with auxiliary external Power supply compatible with Energy Harvesting 8-24VDC

### ACCELEROMETER SPECIFICATIONS

|   |   |
|---|---|
| Accelerometer technology                  | High precision accelerometer based on MEMS technology                               |
| Measurement range                         | two versions: ±2g and ±10g  |
| Sensitivity                               | ±2g Version : 660 mV/g<br>±10g version: 200 mV/g                                    |
| Typical non-linearity                     | ±0.1% FS  |
| Analog to Digital converter               | 24-bit delta-sigma with temperature compensation<br>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   |
| Zero-g Offset Variation from RT over Temp | ±2g Version : ±0.2 mg/°C<br>±10g version: ±0.1 mg/°C                                |
| Sensitivity Variation from RT over Temp   | ±2g Version : ±0.01 %/°C (XY), ±0.02 %/°C (Z)<br>±10g version: ±0.01 %/°C           |
| Offset Ratiometric Error                  | ±2g Version : 4mg   |
| Sensitivity Ratiometric Error             | ±2g Version : ±1.25 % (X-Y), ±0.2 % (Z)   |
| Cross Axis Sensitivity                    | 0.02  |

**TECHNICAL SPECIFICATIONS**

**ADVANCED VIBRATION ANALYSIS TOOL (AVAILABLE ON BEANSCAPE® WILLOW® 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):<br/>Recangular/Hamming/Hann/Blackman/Blackman Harris/<br/>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>   |

**INCLINOMETER SENSOR SPECIFICATIONS**

|   |  |
|---|--|
| Inclinometer Technology   | Inclinometer based on MEMS Technology  |
| Measurement resolution (Bandwidth 10 Hz)  | 0.001° or 0.0174 mm/m or 3.6 arc seconds   |
| Measurement Repeatability (Full scale, @25°C, Static Measurement mode : LowDutyCycle or Alarm mode) | ±15B Version: ±0.003° or ±0.052 mm/m or ±10.8 arc seconds<br>±30B Version: ±0.004° or ±0.070 mm/m or ±14.4 arc seconds |
| Noise spectral density DC to 100 Hz   | 0.0004 °/√Hz   |
| Offset temperature dependency (temperature range -25°C to +85°C)                                    | ±0.002 °/°C  |
| Sensitivity temperature dependency (temperature range -25°C to +85°C)                               | ±0.005 %/°C with temperature compensation  |
| Long term stability (@23°C)   | < 0.004 °  |
| Analog to Digital converter   | 24-bit delta-sigma analog-to-digital with temperature compensation Synchronous measurement channel                     |
| Sensor frequency Response (-3dB)  | DC to 28 Hz  |

**REMOTE CONFIGURATION PARAMETERS**

|  |  |
|--|--|
| Data Acquisition mode<br>(SPS = sample per second) | <p>Low Duty Cycle Data Acquisition (LDCDA) Mode:<br/>1s to 24 hour<br/>Alarm -Low duty cycle: 1s to 24 hour<br/>Streaming mode : 100 SPS by default<br/>Streaming with event-trigger (SET) Mode : 100 SPS by default</p> |
| Sampling Rate (in streaming packet mode)           | <p>Minimum: 1 SPS per axis<br/>Maximum: 2 kSPS per axis</p>  |
| Alarm Threshold                                    | Three level of Alarms ( Alert-Action-Alarm)  |
| Power Mode   | Battery Saver & Active power modes   |

**TECHNICAL SPECIFICATIONS**

**RF SPECIFICATIONS**

|                         |  |
|-------------------------|--|
| Wireless Protocol Stack | IEEE 802.11 b/g/n  |
| WSN Topology            | Point-to-Point / Star / Cluster-Tree                                 |
| Data rate               | UDP: 16 Mbps<br>TCP: 13 Mbps   |
| RF Characteristics      | ISM 2.4GHz. Antenna diversity architecture designed by BeanAir®      |
| Receiver Sensitivity    | -95.7 dBm @1 DSSS<br>-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                               |

**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<br>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 | CE Labelling Directive R&TTE (Radio) ETSI EN 300 328(Europe)<br>FCC (North America)<br>ARIB STD-T66 Ver. 3.6 (Japan)<br>ROHS - Directive 2002/95/EC |

**TECHNICAL SPECIFICATIONS**

**INCLUDED ACCESSORIES**

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

**OPTIONAL ACCESSORIES AND SERVICES**

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

**TECHNICAL SPECIFICATIONS**

**OPTIONAL ACCESSORIES AND SERVICES**

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

**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> |



**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**

31 days  
 65 days  
 87 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**

49 days  
 29 days  
 15 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**

9hours 10 minutes  
 10hours 32 minutes  
 15hours 36 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)

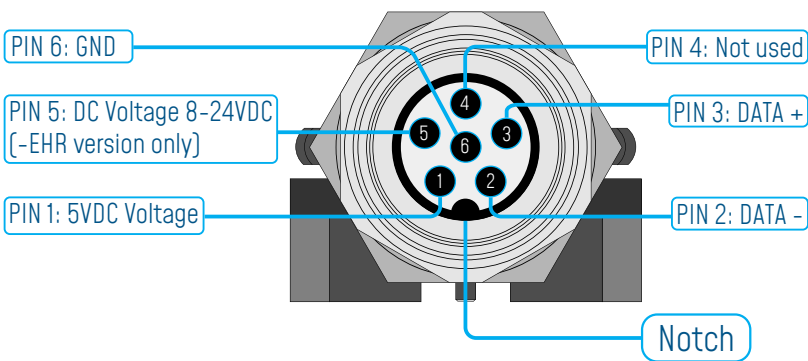
**BeanDevice® WILOW® X-INC**

**BEANDEVICE® WILOW® FRONT VIEW**



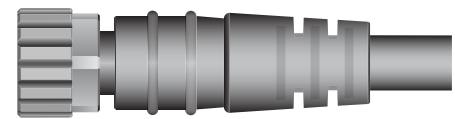
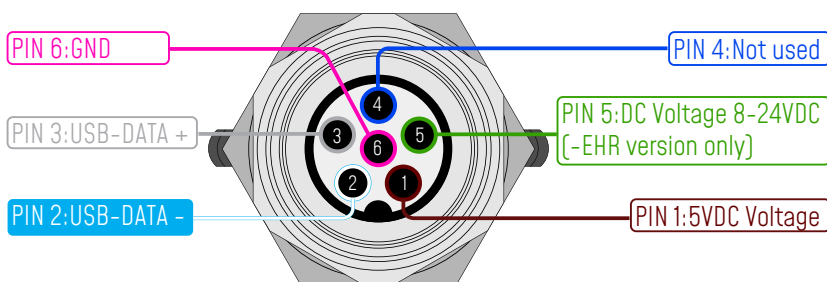
**EXTERNAL POWER SUPPLY WIRING CODE**

**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® X-INC**

**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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