

BeanDevice<sup>®</sup> WILLOW<sup>®</sup> X-INC

ULP (Ultra-Low-Power) WIFI combo sensors [accelerometer, inclinometer and shock] with built-in data logger

FEATURED VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



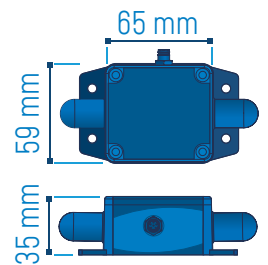
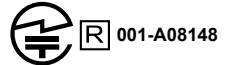
STEP FILE



MQTT TOOLKIT FOR IOT SENSOR



MADE IN GERMANY



MAIN FEATURES

- Embedded data logger: up to 5 million data points (with events dating)
- Waterproof (IP67/NEMA 6) and Rugged aluminum casing,
- First wireless combo sensors on the market integrating accelerometer/inclinometer/shock sensors
- High accuracy accelerometer (measurement range  $\pm 2g$  or  $\pm 10g$ ) with FFT and DIN4150-3 (Ground Vibration) modules
- High accuracy bi-axis inclinometer  $\pm 15^\circ$  or  $\pm 30^\circ$
- ULP (Ultra Low Power) Wifi technology
- 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<sup>®</sup>
- Scalable shock sensor  $\pm 2/4/8/16g$  with SSD (Smart Shock Detection) mode enabling trigger data acquisition on a shock detection
- Smart and flexible power supply:
  - Internal lithium-polymer rechargeable battery (780 mAh)
  - External 5VDC power supply compatible with both USB power and solar energy harvesting

**BeanDevice® WILLOW® X-INC**

**APPLICATIONS**



Structural Health Monitoring

Ground Vibration Monitoring

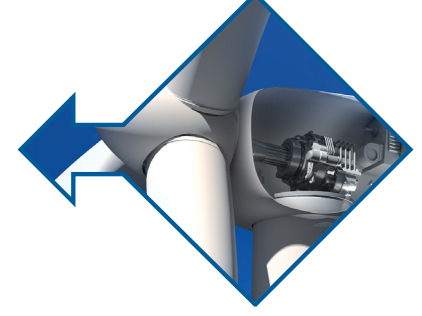


Land Surveying

Test and Measurement



Condition Monitoring



**IIOT**



**MQTT** Ready for Industrial Internet of Things ?



Third - party WIFI Bridge

Third - party Wifi Access Point



WIFI Access Point

**Wilow X-INC**

## 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

## 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-X-INC-ACCMR-INCMR-MO**

**ACCMR** – Measurement Range:

**2** : ±2g measurement range

**10** : ±10g measurement range

**INCMR**– Measurement Range:

**15B** : bi-axis ±15°

**30B** : bi-axis ±30°

**MO** - Mounting option

**BR** - 90° Mounting bracket

**M** - Magnetic Mounting

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

## TECHNICAL SPECIFICATIONS

### ACCELEROMETER SPECIFICATIONS

Accelerometer technology	High precision accelerometer based on MEMS technology
Accelerometer measurement range	two versions: $\pm 2g$ and $\pm 10g$
Sensitivity	$\pm 2g$ Version : 660 mV/g $\pm 10g$ version: 200 mV/g
Typical non-linearity	$\pm 0.1\%$ FS
Analog to Digital converter	24-bit delta-sigma with temperature compensation Synchronous measurement channel
Sensor frequency response (-3 dB)	DC to 800 Hz
Noise spectral density	$\pm 2g$ Version : 45 $\mu g/\sqrt{Hz}$ $\pm 10g$ version: 100 $\mu g/\sqrt{Hz}$
Zero-g Offset Variation from RT over Temp	$\pm 2g$ Version : $\pm 0.2$ mg/ $^{\circ}C$ $\pm 10g$ version: $\pm 0.1$ mg/ $^{\circ}C$

### ACCELEROMETER SPECIFICATIONS

Sensitivity Variation from RT over Temp	$\pm 2g$ Version : $\pm 0.01$ %/ $^{\circ}C$ (XY) , $\pm 0.02$ %/ $^{\circ}C$ (Z) $\pm 10g$ version: $\pm 0.01$ %/ $^{\circ}C$
Offset Ratiometric Error	$\pm 2g$ Version : 4mg $\pm 10g$ version: $\pm 0.2\%$ (XY) , $\pm 0.1\%$ (Z)
Sensitivity Ratiometric Error	$\pm 2g$ Version : $\pm 1.25$ % (X-Y) , $\pm 0.2$ % (Z) $\pm 10g$ Version : $\pm 1.6\%$ (X-Y) , $\pm 0.2$ % (Z)
Cross Axis Sensitivity	2%
Maximum sampling rate	3 kSPS per axis
Onboard temperature sensor	Range $-40^{\circ}C$ to $+65^{\circ}C$ , accuracy $\pm 1^{\circ}C$

### SHOCK SENSOR SPECIFICATIONS

Shock Sensor technology	MEMS technology
Shock sensor range	$\pm 2g/\pm 4g/\pm 6g/\pm 8g/\pm 16g$ dynamically selectable from the BeanScape software
Sensitivity	$\pm 2g$ range: 0.06 mg/digit $\pm 4g$ range: 0.12 mg/digit $\pm 6g$ range: 0.06 mg/digit $\pm 8g$ range: 0.12 mg/digit $\pm 16g$ range: 0.12 mg/digit
Typical non-linearity	$\pm 0.15\%$ on the FS
Analog to Digital converter	12-bits with temperature compensation
Sensor frequency response (-3 dB)	DC to 800 Hz
Noise spectral density	150 $\mu g/\sqrt{Hz}$
Zero-g level change vs temperature (max delta from 25 $^{\circ}C$ )	$\pm 0.5$ mg/ $^{\circ}C$
Sensitivity change Vs temperature	$\pm 0.01\%$ / $^{\circ}C$
Anti-aliasing filter	Butterworth 2th order filter
Maximum sampling rate	1.6 kSPS per axis
Typical zero-g level offset accuracy	$\pm 40$ mg

## TECHNICAL SPECIFICATIONS

### REMOTE CONFIGURATION PARAMETERS

Data Acquisition mode (SPS = sample per second)	Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hour Alarm & Survey mode: 1s to 24 hour Streaming mode : 100 SPS by default Alarm Streaming Mode : 100 SPS by default
Sampling Rate (in streaming packet mode)	Minimum: 1 SPS Maximum: 3 kSPS per axis
Alarm Threshold	2 high levels alarms & 2 low levels alarms
Power Mode	Sleep with Network Listening & Active

### INCLINOMETER SENSOR SPECIFICATIONS

Inclinometer Technology	Inclinometer based on MEMS Technology
Measurement resolution (Bandwidth 10 Hz)	0.001°
Noise density	0.0004 °/√Hz
Accuracy (Full scale)	±0.05° (±0.02° on customer request)
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 ±0.013 %/°C without 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
Noise spectral density DC to 100 Hz	0.0004 °/√Hz

### EMBEDDED DATA LOGGER

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

### RF SPECIFICATIONS

Wireless Protocol Stack	IEEE 802.11 b/g/n
WSN Topology	Point-to-Point / Star / Cluster-Tree
Data rate	250 Kbits/s
RF Characteristics	ISM 2.4GHz – 16 Channels. Antenna diversity architecture designed by BeanAir®
Receiver Sensitivity	-95.7 dBm @1 DSSS -74.0 dBm @54 OFDM
Maximum Radio Range	200 m (L.O.S), radio range can be extended by adding wifi repeater
Antenna	Omnidirectional radome antenna with antenna diversity Gain : 3 dBi Waterproof IP67

**TECHNICAL SPECIFICATIONS**

**ENVIRONMENTAL AND MECHANICAL**

Casing	Aluminum casing Dimensions in mm (LxWxH):35x59x65 mm without antenna & eyelet, Weight (with internal battery, w/o mounting option) : 220g
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) FCC (North America) ARIB STD-T66 Ver. 3.6 (Japan) ROHS - Directive 2002/95/EC
IP   NEMA Rating	Ip67   Nema 6

**INCLUDED ACCESSORIES**

M8 plastic cap	1pcs, <a href="#">Ref: WL-PC</a>
M8 to USB cable	1pcs M8-5pins to USB Cable, 2 meters length. <a href="#">Ref:WL-CBL-M8-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-SCMKIT</a>

**OPTIONS (NOT INCLUDED)**

Power-supply	Wall plug-in, Switchmode power Supply 12V @ 1.25A with USB plug
M8 Cable	M8-5Pins Cable , cable length : - 2 meters. <a href="#">Ref: WL-CBL-M8-2M</a> - 5 meters. <a href="#">Ref: WL-CBL-M8-5M</a>
WIFI AP/Repeater (wifi link extension)	Wireless AP/Repeater with an integrated N-Type RF connector + High Gain Antenna Casing : Polycarbonate Waterproof casing Dimensions: 190 x 46 mm Weight: 196 g Antenna Connector: N-Type Connector (male) Power Supply: 24V, 0.5A PoE Adapter (included) Power Method: Passive Power over Ethernet Max. Power Consumption: 6 Watts Operating Temperature: -40 to 80° C Shock and Vibration: ETSI300-019-1.4 <a href="#">Ref: WL-AP-UBIQ-TIT-7DBI</a> for 7dBi Antenna <a href="#">Ref: WL-AP-UBIQ-TIT-9DBI</a> for 9dBi Antenna

TECHNICAL SPECIFICATIONS

OPTIONS (NOT INCLUDED)

Solar Panel	Polycrystalline Solar Panel for BeanDevice® Wilow® power supply Maximum Power : 3W Optimum operating Voltage: 12 VDC Dimension: 235 mm x 135 mm x 17mm Protection Frame: Aluminum Frame , Waterproof IP67 Length : 2 meters (Ref: WL-SLP-3W-2M) or 5 meters (Ref: WL-SLP-3W-5M) with M8 plug for a direct to connection to the BeanDevice® Wilow® Country of origin: solar panel from China, assembled and tested in Germany
Calibration certificate	Calibration certificate linked to national and international standards (DRAKKS) (Ref: WL-CERT-CAL)

POWER SUPPLY

Rechargeable battery	High density Lithium-Ion rechargeable battery with a capacity of 780 mAh
Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery monitoring
Current consumption @ 3.3V	During data acquisition : 20 to 30 mA During Radio transmission : • 1 DSSS - 278 mA • 54 OFDM - 229 mA During sleep power mode : < 100 µA
External power supply	Two power supplies available: • USB Power supply 5V • 5 VDC compatible with solar energy harvesting

BEANDEVICE® WILLOW® FRONT VIEW



**BeanDevice® WILLOW® X-INC**

**MECHANICAL MOUNTING OPTIONS**

By default, the **BeanDevice® Willow®** 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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