

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

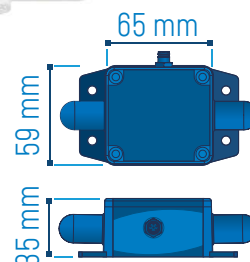


2year
Warranty

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 (IIOT) 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

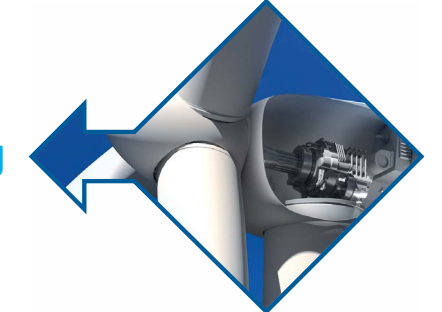
Ground Vibration Monitoring



Test and Measurement



Condition Monitoring

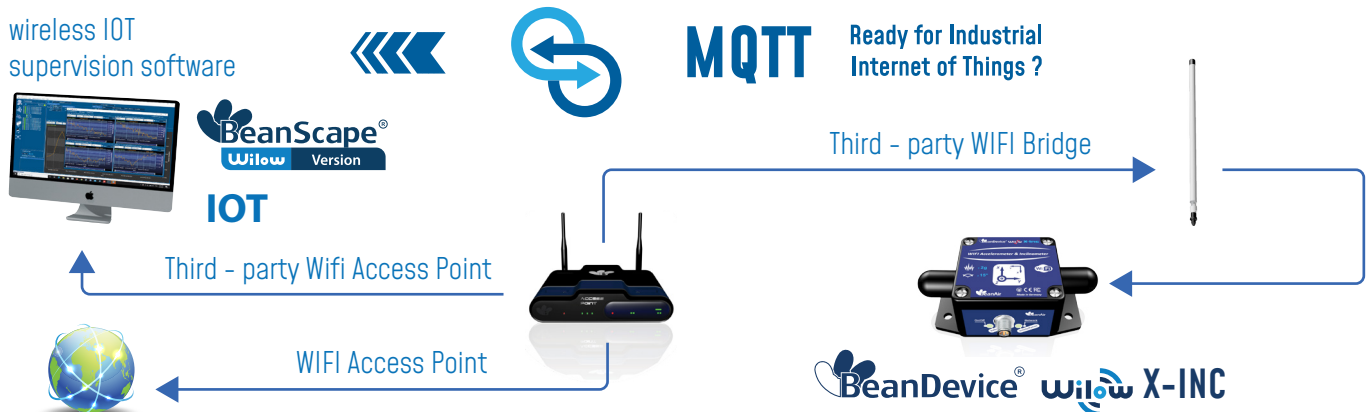


AN OPEN-STANDARD & INDUSTRIAL WIFI TECHNOLOGY

- 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



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® Willow 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-EXPWR-MO-HG

ACCMR- Measurement Range:

2G: $\pm 2g$ measurement range
 10G: $\pm 10g$ measurement range

INCMR- Measurement Range:

15B : bi-axis $\pm 15^\circ$
 30B : bi-axis $\pm 30^\circ$

EXPWR -Auxiliary External Power supply

EHR - Power supply compatible with solar energy harvesting 8-24VDC

MO - Mounting option

BR - 90° Mounting bracket

M - Magnetic Mounting

-HG - High Gain External Antenna 5dBi

If this field is left blank, Integrated Radome Antenna will be provided

Example 1: BND-WILOW-2G-15B-BR

- ULP Wifi Combo sensors accelerometer (measurement range $\pm 2g$) and Inclinator (measurement range $\pm 15^\circ$ Bi-axis) with 90° bracket mounting

Example 2: BND-WILOW-10G-30B-M

- ULP Wifi Combo sensors accelerometer (measurement range $\pm 10g$) and Inclinator (measurement range $\pm 30^\circ$ Bi-axis) with magnet mounting

Example 3: BND-WILOW-2G-15B-EHR-HG

- ULP Wifi Combo sensors accelerometer (measurement range $\pm 2g$) and Inclinator (measurement range $\pm 15^\circ$ Bi-axis) , with auxiliary external Power supply compatible with Energy Harvesting 8-24VDC, High Gain ANTenna"

ACCELEROMETER SPECIFICATIONS

Accelerometer technology	High precision accelerometer based on MEMS technology
Measurement range	$\pm 2g$
Sensitivity	660 mV/g
Typical non-linearity	$\pm 0.1\%$ FS
Analog to Digital converter	24-bit delta-sigma with temperature compensation Synchronous measurement channel Data are transmitted in 12-bits format for better network management
Sensor frequency response (-3 dB)	DC to 800 Hz
Maximum sampling rate	2 kSPS per axis
Noise spectral density	45 $\mu g/\sqrt{Hz}$
Zero-g Offset Variation from RT over Temp	± 0.2 mg/ $^\circ C$
Sensitivity Variation from RT over Temp	± 0.01 %/ $^\circ C$ (XY) , ± 0.02 %/ $^\circ C$ (Z)
Offset Ratiometric Error	4mg
Sensitivity Ratiometric Error	± 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	• Low-Pass Infinite Impulse Response Filter (IIR)
Fast Fourier Transform (FFT)	• Online and Offline FFT • FFT Window Type (offline FFT only): Recangular/Hamming/Hann/Blackman/Blackman Harris/ Gaussian/Kaiser/Taylor/Triangular/Flattop/Bartlett Hann • Automatic FFT Report (Email Transmission) • Configurable Number of FFT points, 128 to 32768 points
Peak Particle de Velocity (PPV)	Available only on the BeanDevice® Wilow® AX-3D with $\pm 2g$ of range: • PPV Log file (Email Transmission) • Automatic DIN4150-3 report (Email Transmission)
Displacement measurement	Available only on the BeanDevice® Wilow® AX-3D with $\pm 2g$ of range

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 Repeatbility (Full scale, @25°C, Static Measurement mode : LowDutyCycle or Alarm mode)	$\pm 15B$ Version: $\pm 0.003^\circ$ or ± 0.052 mm/m or ± 10.8 arc seconds $\pm 30B$ Version: $\pm 0.004^\circ$ or ± 0.070 mm/m or ± 14.4 arc seconds
Noise spectral density DC to 100 Hz	0.0004 °/VHz
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 (SPS = sample per second)	Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hour Alarm -Low duty cycle: 1s to 24 hour Streaming mode : 100 SPS by default Streaming with event-trigger (SET) Mode : 100 SPS by default
Sampling Rate (in streaming packet mode)	Minimum: 1 SPS per axis Maximum: 2 kSPS per axis
Alarm Threshold	Three level of Alarms (Alert-Action-Alarm)
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®
Rx Sensitivity	-95.7 dBm @1 DSSS -74.0 dBm @54 OFDM
Maximum Radio Range	With High Gain Antenna : 100-200m (L.O.S), 40-80m (N.L.O.S.) With Integrated Radome Antenna : 50-100m (L.O.S), 20-50m (N.L.O.S.) In both case Radio Range can be extended by adding Wifi Bridge/Repeater"
Antenna	Antenna diversity : High Gain Antenna : 2 x N-Type Antenna 5dBi Radome Antenna : 2 x Antenna 2,2 dBi
OTA	Over the air firmware upgrade via WIFI

EMBEDDED DATA LOGGER

Storage Capacity	460000 data logs per sensor channel (streaming mode) - 3 for accelerometers, 2 for inclinometers
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	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

INCLUDED ACCESSORIES

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

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)

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 REF: WL-SLP-5W-2M ,5W Solar panel with 2 meters of cable length REF: WL-SLP-5W-5M ,5W 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 Ref: WL-CERT-CAL

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 hereafter and battery life simulation toolkit available on our website
External power supply	<ul style="list-style-type: none"> • USB Power supply 5V • Optional auxiliary external Power Supply: 8VDC to 24VDC compatible with solar energy harvesting

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 combinations 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

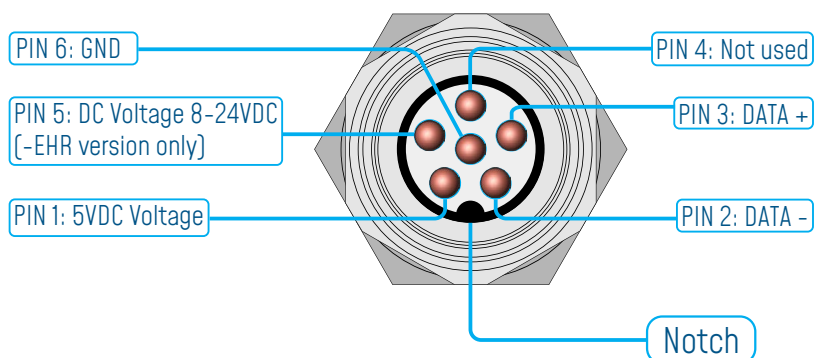
>= 3 years (depends on battery cycle life)

BEANDEVICE® WILOW® FRONT VIEW



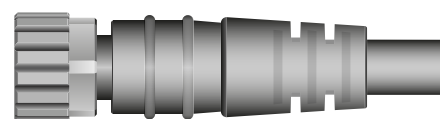
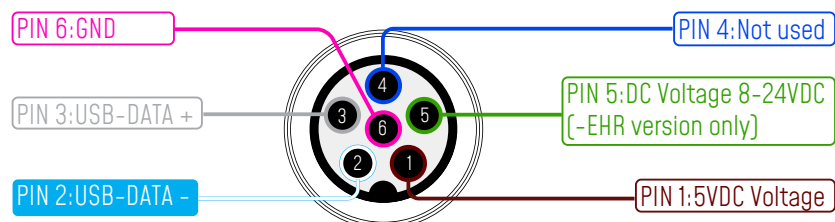
EXTERNAL POWER SUPPLY WIRING CODE

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

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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