BeanAir
WIRELESS IIOT SENSORS

Wilow

BeanDevice® WILOW® AX-3D

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

PRODUCT VIDEO

USER GUIDE

QUICK START
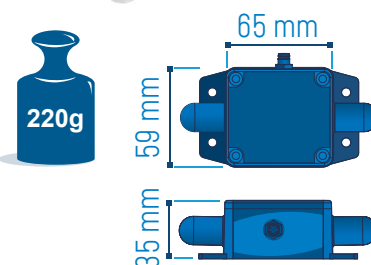
MECHANICAL DRAWING

STEP FILE

MQTT TOOLKET FOR IOT SENSOR

2year Warranty

MADE IN GERMANY

CE   FC   ® 001A-08148

WiFi® CERTIFIED

220g

65 mm

59 mm

35 mm

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 ±2g) 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

Date :19-05-2024

BeanDevice® WILOW® AX-3D

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

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MQTT | OPEN-STANDARD INTERNET OF THINGS PROTOCOL.

wireless IOT supervision software

BeanScape® Wilow Version

IOT

MQTT Ready for Industrial Internet of Things ?

Third – party WIFI Bridge

Third – party Wifi Access Point

WIFI Access Point

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

Third – party WIFI Bridge

OR

5V USB

BeanDevice® Wilow AX-3D

Third – party Wifi Access Point

wireless IOT supervision software

BeanScape® Wilow Version

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

STORE & FORWARD +

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

PRODUCT REFERENCE

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

MR - Measurement Range:	MO - Mounting option	EXPWR -Auxiliary External Power supply	-HG - High Gain External Antenna 5dBi
2G: ±2g measurement range	BR - 90° Mounting bracket	EHR - Power supply compatible with solar energy harvesting 8-24VDC	If this field is left blank, Integrated Radome Antenna will be provided
	M - Magnetic Mounting		

Example 1: BND-WILOW-WIFI-AX3D-2G-BR
ULP WIFI accelerometer with ±2g range with 90° Mounting bracket , integrated radome antenna
Example 2: BND-WILOW-WIFI-AX3D-2G-M
ULP WIFI accelerometer with ±2g range with magnetic mounting, Integrated radome antenna
Example 3: BND-WILOW-WIFI-AX3D-2G-HG
ULP WIFI accelerometer with ±2g range with High Gain External Antennas

MAIN ACCELEROMETER SPECIFICATIONS

Accelerometer technology	High precision accelerometer based on MEMS technology
measurement range	±2g
Sensitivity	660 mV/g
Typical non-linearity	±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 µg/ √Hz
Zero-g Offset Variation from RT over Temp	±0.2 mg/°C
Sensitivity Variation from RT over Temp	±2g Version : ±0.01 %/°C (XY) , ±0.02 %/°C (Z)
Offset Ratiometric Error	4mg
Sensitivity Ratiometric Error	±1.25 % (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.

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

Software Filter	• Low-Pass Infinite Impulse Response Filter (IIR)

Fast Fourrier 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 ±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 ±2g of range

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 mode)	Minimum: 1 SPS per axis Maximum: 2 kSPS per axis
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	With High Gain Antenna : 100-200m (L.O.S), 40-80m (N.L.O.S.) With Integarted 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

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USB SPECIFICATIONS	
USB standard	USB 2.0
Data Rate	Full speed operation(12MB/s)
Related functions	• Firmware update • Wifi & system configuration

EMBEDDED DATA LOGGER	
Storage Capacity	772900 data logs per sensor channel (streaming mode)
Wireless data downloading	2 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

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	•USB Power supply 5V •Optional auxiliary external Power Supply: 8VDC to 24VDC compatible with solar energy harvesting

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

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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 REF: WL-USB-5V-PWR
M8 Cable	M8-6Pins Cable, Waterproof (IP67) and shielded cable , cable length : • 2 meters. Ref: WL-CBL-M8-6P-2M • 5 meters. Ref: WL-CBL-M8-6P-5M
Standalone solar power system	High efficiency solar panel with Solar charging controller and Lead-acid battery Ref.: X-SOL-7AH-20W-5V-5M for USB power Ref.: X-SOL-7AH-20W-12V-5M for- EHR VERSION Ref: X-SOL-14AH-20W-4CH-5V-5M for USB power Ref: X-SOL-14AH-20W-4CH-12V-5M for -EHR VERSION Ref: X-SOL-14AH-80W-4CH-5V-5M for USB power Ref: X-SOL-14AH-80W-4CH-12V-5M 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 acqusiition with battery saver mode enabled The 5W solar panel works only with LowDutyCycle, Survey/Alarm & streaming burst data acqusiition 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

Conditions: Battery saver mode enabled , Temperature 25degC, BeanDevice listening to new config every 18h	Battery Life with Slow Measurement Rate (LDCDA) Internal LiPO Battery
Battery Saver mode Enabled, Measurement Cycle every minute	40 days
Battery Saver mode Enabled, Measurement Cycle every 5 minutes	72 days
Battery Saver mode Enabled, Measurement Cycle every hour	88 days

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Conditions: Battery saver mode enabled , Temperature 25degC, BeanDevice listening to new config every 18h	Battery Life with Slow Measurement Rate (LDCDA) External 5W Solar Panel (REF: WL-SLP-5W-2M) EHR Option
Battery Saver mode Enabled, Measurement Cycle 20s to 1 measurement per day	>= 3 years (depends on battery cycle life)

Conditions: Battery saver mode enabled Temperature 25degC	Battery Life with Fast Measurement Rate (Streaming Burst)- Internal Battery
Wakes up every 2 hours, Sample at 200Hz during 20s	54 days
Wakes up every 1 hour, Sample at 500Hz during 20s	34.5 days
Wakes up every 20 minutes, Sample at 200Hz during 20s	18 days

Conditions: Battery saver mode enabled Temperature 25degC	Battery Life with Fast Measurement Rate (Streaming Burst)- with X-SOLAR-7AH or X-SOLAR-14AH
All timing combinatios related to streaming burst option	>= 3 years (depends on battery cycle life)

Conditions: 25degC	Battery Life with Fast Measurement Rate (Continuous Streaming)- Internal Battery
Sampling Rate 2000Hz	11hours 52 minutes
Sampling Rate 1000Hz	13hours 41 minutes
Sampling Rate 100Hz	19hours 46 minutes

Conditions: 25degC	Internal Battery Life with Fast Measurement Rate (Continuous Streaming)-with X-SOLAR-7AH or X-SOLAR-14AH
Sampling Rate 10Hz to 2000Hz	>= 3 years (depends on battery cycle life)

BEANDEVICE® WILOW® FRONT VIEW

- Radome Antenna on Both sides
- M8-6 pins connector for USB & Power supply
- Activity / Failure LED
- Battery Charge LED

EXTERNAL POWER SUPPLY WIRING CODE

M8-6Pins socket (Male, A-Coding) – PIN ASSIGNATION

PIN 6: GND
PIN 5: DC Voltage 8-24VDC (-EHR version only)
PIN 1: 5VDC Voltage
PIN 4: Not used
PIN 3: DATA +
PIN 2: DATA -
Notch
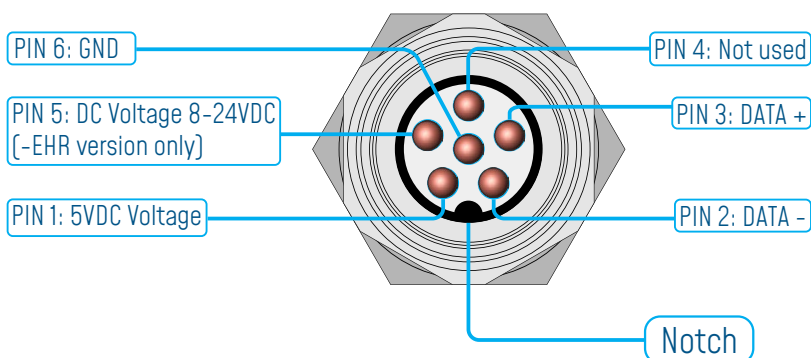
Interface Name	M8 Pin assignation
5VDC Voltage	PIN 1
DATA -	PIN 2
DATA +	PIN 3
Not used	PIN 4
DC Voltage 8-24VDC (-EHR version only)	PIN 5
GND	PIN 6

M8-6Pins Plug (Female, A-Coding) – PIN ASSIGNATION

PIN 6:GND
PIN 3:USB-DATA +
PIN 2:USB-DATA -
PIN 4:Not used
PIN 5:DC Voltage 8-24VDC (-EHR version only)
PIN 1:5VDC Voltage
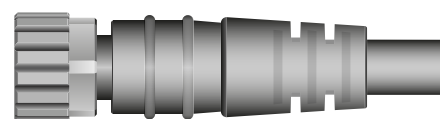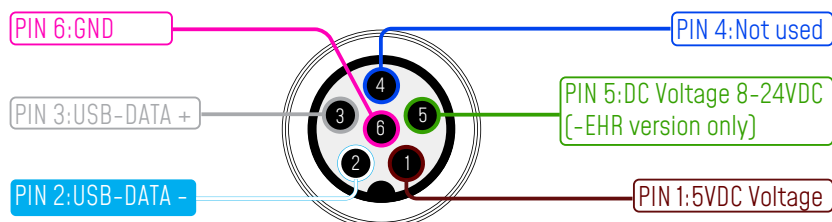
M8-6Pins Plug

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

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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

VIDEO

SCREWS MOUNTING

90° BRACKET

MAGNETIC MOUNTING LID

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