

BeanDevice® WILOW® HI-INC

ULP (ULTRA-LOW-POWER) WIRELESS IOT INCLINOMETER

PRODUCT VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



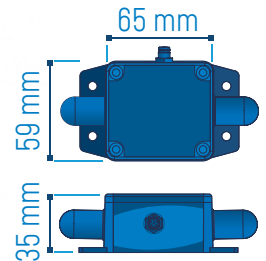
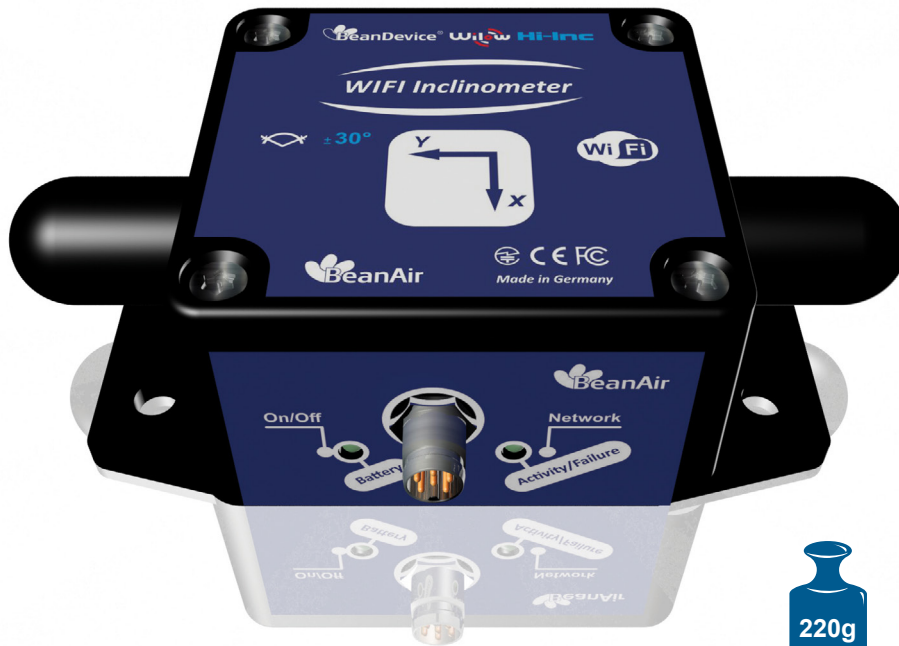
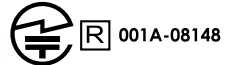
STEP FILE



MQTT TOOLKIT FOR IOT SENSOR



MADE IN GERMANY



MAIN FEATURES

- ULP (Ultra Low Power) Wifi technology
- Store and Forward+: lossless data transmission
- 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)
- Excellent radio link relying on the radio antenna diversity designed by Beanair®
- Embedded data logger: up to 5 million data points (with events dating)
- IIOT Ready: integrates MQTT data exchange, an open-source Internet of Things (IOT) protocol
- Waterproof (IP67/NEMA 6) and Rugged aluminum casing,
- USB 2.0 link for device configuration (including firmware upgrade)
- Over the Air Firmware upgrade via WIFI
- 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



Land Surveying

Test and Measurement



Structural Health Monitoring

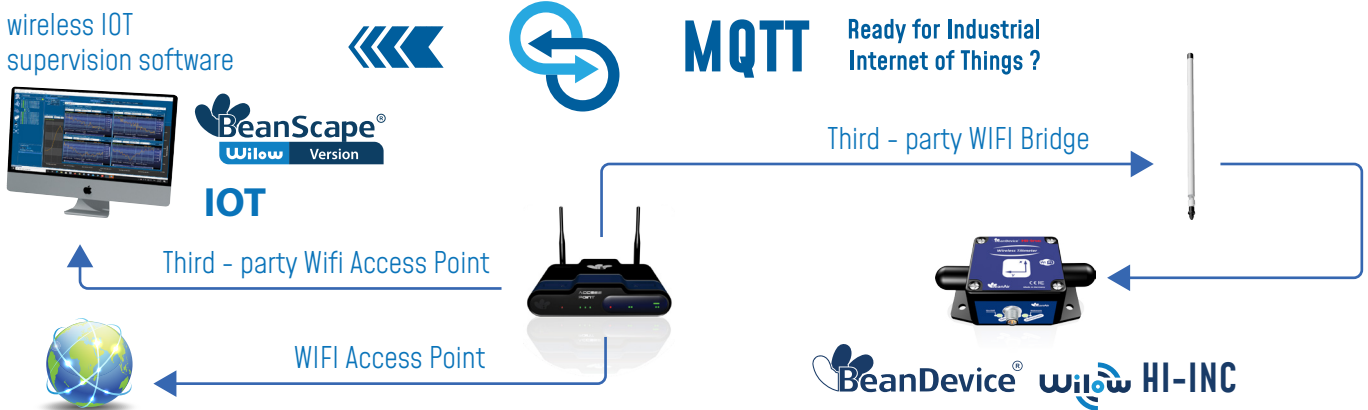
AN OPEN-STANDARD & INDUSTRIAL WIFI TECHNOLOGY

- 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® HI-INC

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 HI-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-HI-INC -MR-MO-EXPWR

| | | |
|--------------------------------|-----------------------------|--|
| MR - Measurement Range: | MO - Mounting option | EXPWR -Auxiliary External Power supply |
| 15B: bi-axis ±15° | BR - 90° Mounting bracket | |
| 30B: bi-axis ±30° | M - Magnetic Mounting | EHR - Power supply compatible with solar energy harvesting 8-24VDC |

Example 1: BND-WILOW-WIFI-HI-INC-15B-BR - ULP WIFI bi-axis inclinometer (measurement range ±15°) with 90° bracket mounting

Example 2: BND-WILOW-WIFI-HI-INC-30B-M - ULP WIFI bi-axis inclinometer (measurement range ±30°) with magnetic mounting

Example 3: BND-WILOW-WIFI-HI-INC-15B-EHR - ULP WIFI bi-axis inclinometer (measurement range ±15°) with auxiliary external Power supply compatible with Energy Harvesting 8-24VDC

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 ±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 |
| 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. |

TECHNICAL SPECIFICATIONS

REMOTE CONFIGURATION PARAMETERS

| | |
|--|--|
| Data Acquisition mode (SPS = sample per second) | <ul style="list-style-type: none"> • 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 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 | 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) |

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 |
| 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"> • 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 | <ul style="list-style-type: none"> • 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-SCMKIT |

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 |
| 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) Ref: WL-AP-UBIQ-TIT-7DBI for 7dBi Antenna Ref: WL-AP-UBIQ-TIT-9DBI for 9dBi Antenna |
| 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 |
| 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 |

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

32 days
 66 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

50 days
 33 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

11hours 7 minutes
 12hours 32 minutes
 16hours 28 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)

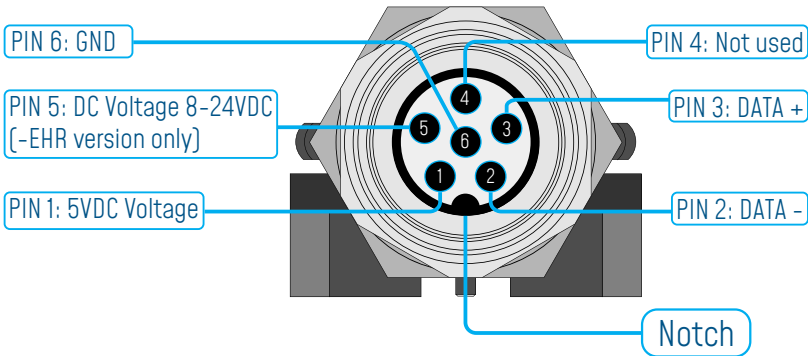
BeanDevice® WILOW® HI-INC

BEANDEVICE® WILOW® FRONT VIEW



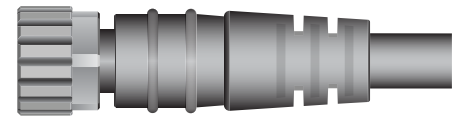
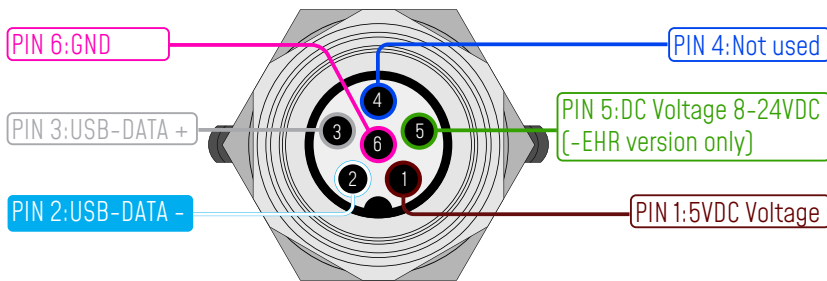
EXTERNAL POWER SUPPLY WIRING CODE

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® HI-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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