

# BeanDevice® 2.4GHz HI-INC

Wireless IIOT inclinometer | tilt, inclination, slope monitoring

PRODUCT VIDEO



APPLICATION VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



STEP FILE



SmartSensor



2year  
Warranty

MADE IN GERMANY



207-132085



145g

55mm

80mm

21mm

## MAIN FEATURES



• Wireless inclinometer (measurement range  $\pm 15^\circ, \pm 30^\circ$ )



• Time-synchronized wireless sensor networks ( $\pm 2.5$ ms of accuracy)



• Embedded data logger : up to 1 million data points (with events dating)



• Excellent radio link relying on the radio antenna diversity developed by Beanair®



• Waterproof IP67 casing (Nema 6)



• Integrated Lithium-Ion battery charger

**BeanDevice® 2.4GHz HI-INC**

**APPLICATIONS**

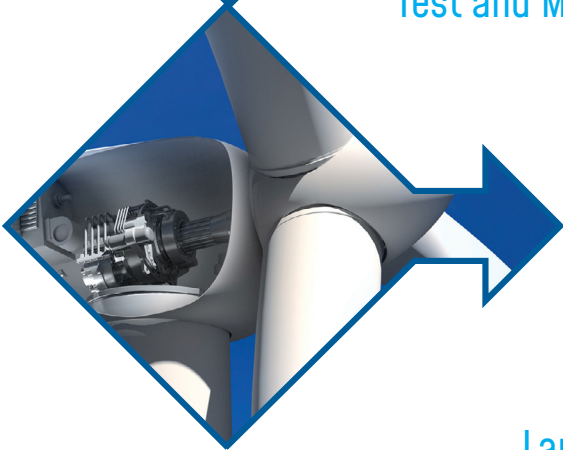


Structural Health Monitoring

Test and Measurement



Condition Monitoring



Land Surveying



For further information about bridge monitoring, please read the following applications note : AN\_RF\_002 – “Bridge monitoring with BeanAir® products

**TIME-SYNCHRONIZED WIRELESS IIOT SENSORS**

TimeSync function brings time-synchronization over the Wireless IIOT Sensors ( $\pm 2.5$ ms of accuracy between each wireless IIOT sensor) and contributes to enhance user experience about correlation of remote sensing data and modal analysis.



## BeanDevice® 2.4GHz HI-INC

### REMOTE CONFIGURATION & MONITORING

#### BeanScope® Basic

The **BeanScope®** application allows the user to view all the data transmitted by the **BeanDevice® 2.4GHz HI-INC**. Thanks to the OTAC (Over-the-Air configuration) feature, the user can remotely configure the **BeanDevice® 2.4GHz HI-INC**.

SEVERAL DATA ACQUISITION MODES ARE AVAILABLE ON THE BEANDEVICE® 2.4GHz HI-INC :

- **Low Duty Cycle Data Acquisition mode (LDCDA)** : the data acquisition is immediately transmitted by radio. The transmission frequency can be configured from 1s to 24h.
- **Survey Mode**: the measured value is transmitted by radio whenever an alarm threshold (fixed by the user) is detected (4alarms threshold levels High/Low). Meanwhile, the device sends frequently a beacon frame informing its current status.
- **Streaming Packet Mode** : all measured values are transmitted by packet within a continuous flow at 60 samples per second maximum



#### BeanScope® 2.4GHz Premium+ Add-on

The **BeanScope® 2.4GHz Premium+** integrates an OPC DA server (Data Access). OPC DA is particularly well suited for real time measurement and data sharing.

Each data/measurement can be associated to a tag or its attributes and shared with one or many OPC clients.

**i** For further information about the different data acquisition modes:  
TN-RF-008 – “Data acquisition modes available on the BeanDevice®”

### ANTENNA DIVERSITY

While the vast majority of wireless IIOT sensors show their limits in harsh industrial environment, the **BeanDevice® 2.4GHz HI-INC** integrates an innovative antenna diversity design, boosting the radio link quality in environments subject to random and diverse disturbances. Antenna Diversity improves both the quality and reliability of a wireless link by 30%.



**EMBEDDED DATA LOGGER UP TO 1 MILLION DATA POINTS**

The **BeanDevice® 2.4GHz HI-INC** integrates an embedded datalogger, which can be used to log data when a Wireless IIOT Sensors can not be easily deployed on your site. All the data acquisition are stored on the embedded flash and then transmitted to the **BeanGateway® 2.4GHz** when a Wireless IIOT Sensors is established.

The data logger function is compatible with all the data acquisition mode available on the **BeanDevice® 2.4GHz HI-INC** :

- LowDutyCycle Data Acquisition
- Survey
- Streaming packet

**EXAMPLE : TILT MONITORING ON A BRIDGE**

- In standalone operation, the **BeanDevice® 2.4GHz INC** stores all the measurements on its onboard datalogger. Thus, a direct connection with the **BeanGateway® 2.4GHz** is not needed.
- During the measurement campaign, all the acquired measurements are stored on datalogger.
- Data logs can be transmitted to the **BeanGateway® 2.4GHz** on request. Once a successful transmission is done, the user can choose to erase automatically the logs from the datalogger memory, so new ones can be stored.



**i** For further information about data logger, please read the following technical note : **TN-RF-007 – “BeanDevice® DataLogger User Guide ”**

## TECHNICAL SPECIFICATIONS

### PRODUCT REFERENCE

#### BND-2.4GHZ-HI-INC-MR-PS

**MR** – Measurement Range

**15B** : bi-axial  $\pm 15^\circ$

**30B** : bi-axial  $\pm 30^\circ$

**PS** - Power Supply

**RB** : Internal rechargeable battery

**XT** : External Power supply

**Example n°1:** BND-2.4GHZ-HI-INC-15B-RB, wireless bi-axial inclinometer with  $\pm 15^\circ$  measurement range, internal rechargeable battery

**Example n°2:** BND-2.4GHZ-HI-INC-30B-XT, wireless bi-axial inclinometer with  $\pm 30^\circ$  measurement range, external primary cell

### SENSOR SPECIFICATIONS

Inclinometer Technology	Accurate and low power MEMS technology
Measurement resolution (Bandwidth 10 Hz)	0.001°
Noise density	0.0004 °/√Hz
Accuracy (full scale, @ 25°C)	$\pm 0.05^\circ$ ( $\pm 0.02^\circ$ on customer request)
Offset temperature dependency	$\pm 0.002^\circ/\text{°C}$
Sensitivity temperature dependency	$\pm 0.005\%/^\circ\text{C}$
Long term stability (@23°C)	< 0.004 °
Analog to Digital converter	16-bits, SAR architecture (Successive Approximation Register) with temperature compensation
Sensor frequency Response (-3 dB)	DC to 28 Hz
Noise spectral density DC to 100 Hz	0.0004 °/√Hz
Anti-aliasing filter	Butterworth 5th order filter – cut-off frequency : 1 Hz to 100 Hz remotely programmable (BeanScope®)

### OVER-THE-AIR CONFIGURATION (OTAC) PARAMETERS

Data Acquisition mode (SPS = sample per second)	Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hour Streaming Mode (not available on XT version, External power supply) Survey Mode: 1s to 24h
Sampling Rate (in streaming packet mode)	Minimum: 1 SPS Maximum: 60 SPS on each axis
Alarm Threshold	2 High level and 2 Low level
Programmable cut-off frequency (Anti-aliasing filter)	1– 100 Hz
Power Mode	Sleep Active (not available on XT version, External power supply)

## TECHNICAL SPECIFICATIONS

### RF SPECIFICATIONS

Wireless Protocol Stack	Ultra-Power and license-free 2.4Ghz radio technology (IEEE 802.15.4E)
WSN Topology	Point-to-Point / Star
Data rate	250 Kbits/s
RF Characteristics	ISM 2.4GHz – 16 Channels. Antenna diversity designed by Beanair®
TX Power	+18 dBm
Receiver Sensitivity	-104dBm
Maximum Radio Range	650m (Line of Sight) , 30-100m (Non Line of Sight)
Antenna	Omnidirectional radome antenna with antenna diversity Gain : 3 dBi Waterproof IP67

### EMBEDDED DATA LOGGER

Storage capacity	up to 1 millions data points
Wireless data downloading	3 minutes to download the full memory (average time)

### TIMESYNC FUNCTION : CLOCK SYNCHRONIZATION OVER THE WIRELESS SENSOR NETWORKS (WSN)

Clock synchronization accuracy	±2.5 ms (at 25°C)
Crystal specifications	Tolerance ±10ppm, stability ±10ppm

### ENVIRONMENTAL AND MECHANICAL

Casing	Aluminum & Waterproof casing Dimensions in mm (LxWxH): 100x55x21 mm Weight (battery included) : 155g
IP   NEMA Rating	IP67   Nema 6
Shock resistance	100g during 50 ms
Operating Temperature	<b>RB : Internal rechargeable battery</b> -20 °C to +65 °C during battery discharge 0 to 45°C during battery charge <b>XT : External Power Supply</b> -40 °C to +75 °C during battery discharge
Norms & Radio Certifications	<ul style="list-style-type: none"> <li>· CE Labelling Directive R&amp;TTE (Radio) ETSI EN 300 328</li> <li>· FCC (North America)</li> <li>· ARIB STD-T66 Ver 3.6</li> <li>· ROHS - Directive 2002/95/EC</li> </ul>

## TECHNICAL SPECIFICATIONS

### POWER SUPPLY

Integrated battery charger	Integrated Lithium-ion battery charger with high precision attery monitoring : · Overvoltage Protection, Overcurrent Short-Circuit Protection, Undervoltage Protection · Battery Temperature monitoring
Current consumption @3.3V	· During data acquisition : 30 to 40 mA · During Radio transmission : 80 mA @ 18 dBm · During sleeping : < 38 µA
External power supply	8-28VDC
Rechargeable battery	High density Lithium-Ion rechargeable battery with a capacity of 950 mAh

### OPTION(S)

External Power Supply	Wall plug-in, Switchmode power Supply 12V @ 1.25A with sealed M8 Plug (IP67/Nema 6) <a href="#">Ref: M8-PWR-12V</a>
Solar Panel Kit (compatible with External Power Supply version only)	High efficiency solar panel with Solar charging controller and Lead-acid battery <a href="#">Ref: X-SOL-5W-M8-2M</a>
External Primary Cell in a Waterproof IP67 Casing	Exernal Primary cell mounted in a IP67 aluminum Alloy casing: IP67 Battery Holder Lithium-thionyl chloride primary cell (Li-SOCl2) 6.5 Ah <a href="#">Ref: PRIM-XTENDER</a>
M8 extension cable for external power supply	Molded cable with M8-3pins male plug Material: PVC with shield protection IP Rating : IP67   Nema 6 Cable length: 2 meters , <a href="#">Ref: CBL-M8-2M</a> Cable length : 5 meters, <a href="#">Ref: CBL-M8-5M</a> Cable length: 10 meters, <a href="#">Ref: CBL-M8-10M</a>
Calibration certificate	Calibration certificate provided by Beanair GmbH A static calibration method is used on a granite surface plate DIN876

**BeanDevice® 2.4GHz HI-INC**

**GETTING STARTED WITH A WIRELESS IIOT SENSORS**

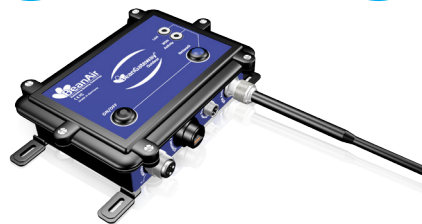
The **BeanDevice® 2.4GHz HI-INC** operates only on our **Wireless IIOT Sensors**, you will need the **BeanGateway® 2.4GHz** and the **BeanScope® 2.4 GHz** for starting a wireless IIOT sensors.



**BeanDevice**  
**2.4GHz HI-INC**



**BeanScope**  
Wireless IIOT Sensors Supervision Software



**BeanGateway**  
Outdoor Version

**2year**  
Warranty

**i** For further information about **BeanDevice®** battery life :  
TN-RF-002 Current consumption in active & sleeping mode  
TN-RF-012 Beandevic autonomy in Streaming and Streaming Packet Mode

**BEANDEVICE® 2.4GHz HI-INC FRONT VIEW**

Waterproof Antenna

Battery charge led

Network Reset  
non-contact push button

**BeanDevice®**  
**2.4GHz HI-INC**

Network led

ON/OFF  
non-contact button

M8 Socket for power  
supply [ 8-28 VDC ]



Product specifications are subject to change without notice.  
Contact Beanair for latest specifications.



**BeanDevice® 2.4GHz HI-INC**

**OPTIONS AND ACCESSORIES**



**AC/DC Power supply with M8 Plug**

Ref: M8-PWR-12V

- Wall plug-in power supply, Output: 12VDC, M8-3Pins plug
- AC Power plug: Europe/UK/Northamerica/China Australia
- Waterproof - IP67



**X-SOLAR**

(SOLAR Charging Controller)

High efficiency Solar Panel with Solar Charging Controller and Lead-acid battery



**Molded Cable** with M8 plug

Ref: CBL-M8-2M

- [cable length : 2 meters]
- CBL-M8-5M [cable length : 5 meters]
- CBL-M8-10M [cable length : 10 meters]

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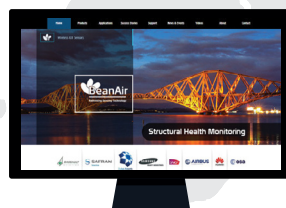
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