BeanDevice® Inc

Low cost wireless inclinometer ±30° or ±90°

with integrated data logger

2.4 GHz

DATASHEET

SmartSensor

www.beanair.com

Wireless Inclinometer

BeanDevice® Inc

MADE IN GERMANY

Video

VIDEO Featured Video

User Guide

USER MANUAL

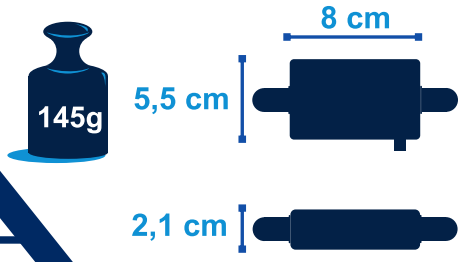
Quick Start

Quick Start

Mechanical Drawing

DRAWING

STEP File



OVERVIEW

- Wireless inclinometer (measurement range ±15°, ±30°)
- Time-synchronized wireless sensor networks (±2.5ms of accuracy)
- Embedded data logger : up to 1 million data points (with events dating)
- Waterproof IP67 casing (Nema 6)
- Integrated Lithium-Ion battery charger
- Excellent radio link relying on the radio antenna diversity developed by Beanair®

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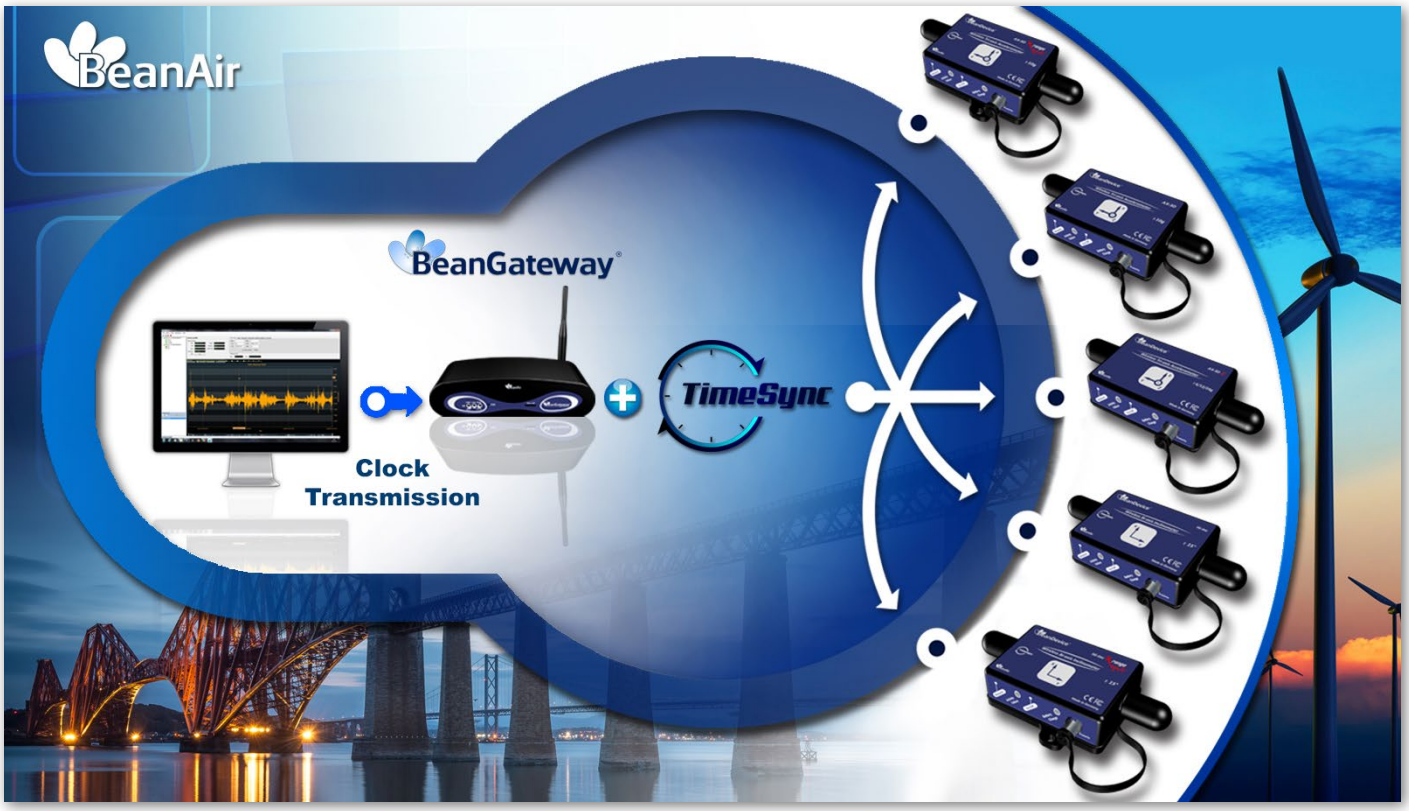
APPLICATIONS

- ANTENNA POSITIONNING
- FLIGHT TEST MEASUREMENT
- BENCHMARK ON CAR FRAME STABILITY
- STRUCTURAL HEALTH MONITORING

For further information about bridge monitoring, please read the following applications note :
AN_RF_002 – "Bridge monitoring with BeanAir® products"

Time-Synchronized Wireless Sensor Networks

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



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Remote Configuration & Monitoring

BeanScape® Basic

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

SEVERAL DATA ACQUISITION MODES ARE AVAILABLE ON THE BEANDEVICE® 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 (4 alarms 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 3 ksps/s maximum

BeanScape ® Premium+ Add-on

The BeanScape® 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.

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 sensors show their limits in harsh industrial environment, the BeanDevice® 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%.

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Embedded data logger up to 1 million data points

The BeanDevice® INC integrates an embedded datalogger, which can be used to log data when a Wireless Sensor network can not be easily deployed on your site. All the data acquisition are stored on the embedded flash and then transmitted to the BeanGateway® when a Wireless Sensor Network is established.
The data logger function is compatible with all the data acquisition mode available on the BeanDevice® INC :

- LowDutyCycle Data Acquisition
- Survey
- Streaming packet

EXAMPLE : TILT MONITORING ON A BRIDGE

- In standalone operation, the BeanDevice® INC stores all the measurements on its onboard datalogger. Thus, a direct connection with the BeanGateway® is not needed.
- During the measurement campaign, all the acquired measurements are stored on datalogger.
- Data logs can be transmitted to the BeanGateway® 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.

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

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Technical Specifications

Product reference	
BND-INC –MR–PS	
MR – Measurement Range	**PS -** Power Supply
30B : bi-axial ±30°	**RB :** Internal rechargeable battery
90B : bi-axial ±90°	**XT :** External Power supply
Example 1: BND-INC-30B-RB-wireless bi-axial inclinometer with ±30° measurement range, internal rechargeable battery	
Example 2: BND-INC-90B-XT-wireless bi-axial inclinometer with ±90° measurement range, external primary cell	

Sensor specifications	
Inclinometer Technology	Accurate and low power MEMS technology
Measurement resolution (Bandwidth 10 Hz)	0.0025°
Noise density	0.0008 °/√Hz
Accuracy (full scale, @ 25°C)	±0,1°
Offset temperature dependency	±0.008 °/°C
Sensitivity temperature dependency	±0.008 %/°C
Long term stability (@23°C)	< 0.014 °
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	0.0008 °/ √Hz
Anti-aliasing filter	Butterworth 5th order filter – cut-off frequency : 1 Hz to 100 Hz remotely programmable (BeanScape®)

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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)
Sampling Rate (in streaming packet mode)	Minimum: 1 SPS Maximum: 3 kSPS per axis (one axis enabled) 1,5 kSPS per axis (2-axis enabled) 1 kSPS per axis (3-axis enabled)
Alarm Threshold	High and Low alarms threshold
Programmable cut-off frequency (Anti-aliasing filter)	1– 100 Hz
Power Mode	Sleep Active (not available on XT version, External power supply)

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 & Waterpoof 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	-20 °C to +65 °C
Norms & Radio Certifications	· CE Labelling Directive R&TTE (Radio) ETSI EN 300 328
	· FCC (North America)
	· ARIB STD-T66 Ver 3.6
	ROHS - Directive 2002/95/EC

Power supply	
Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery 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

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Option(s)	
External Power Supply	Wall plug-in, Switchmode power Supply 12V @ 1,25A with sealed M8 Plug (IP67/Nema 6) Ref: M8-PWR-12V
Solar Panel Kit (compatible with External Power Supply version only)	“High effeciency solar panel with with Solar charging controller and Lead-acid battery **Ref: X-SOL-5W-M8-2M**
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 **Ref: PRIM-XTENDER**
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 , Ref: CBL-M8-2M Cable length : 5 meters, Ref: CBL-M8-5M Cable length: 10 meters, Ref: CBL-M8-10M
Calibration certificate	Calibration certificate provided by Beanair GmbH A static calibration method is used on a granite surface plate DIN876

Getting started with a Wireless Sensor Networks

The BeanDevice® INC operates only on our Wireless Sensor Networks, you will need the BeanGateway® and the BeanScape® for starting a wireless sensor Network.

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

Wireless Inclinometer

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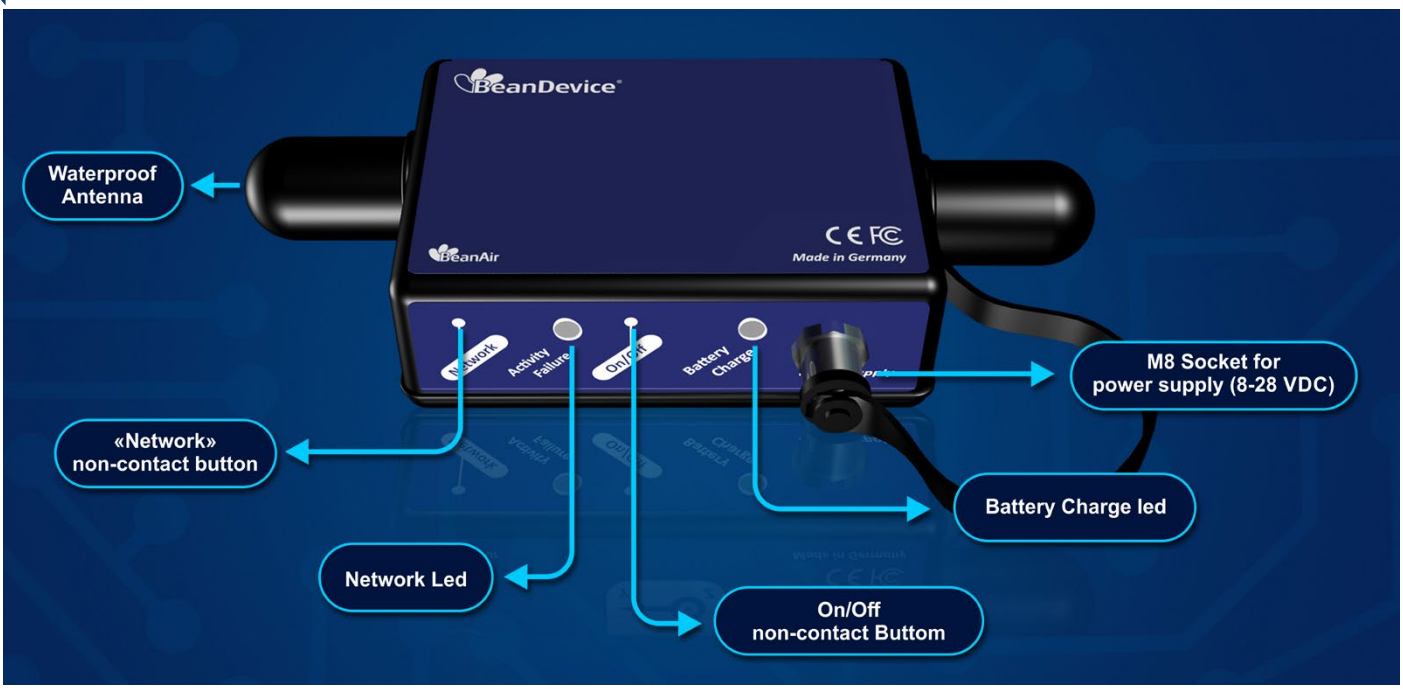
Beandevice® INC Front View



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

Options and Accessories

Molded Cable with M8 plug

Ref: CBL-M8-2M (cable length: 2meters)

- CBL-M8-5M (cable length : 5 meters)

- CBL-M8-10M (cable length : 10 meters)

External Primary cell
Ref: PRIM_XTEND

PRIM XTENDER - Extend your Beandevice battery autonomy External Primary cell mounted in a IP67 Alloy casing:
. IP67 Battery Holder
. Alloy Casing
. Lithium-thionyl chloride primary cell (Li-SOCl2) 6,5 Ah

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

BeanDevice® Inc

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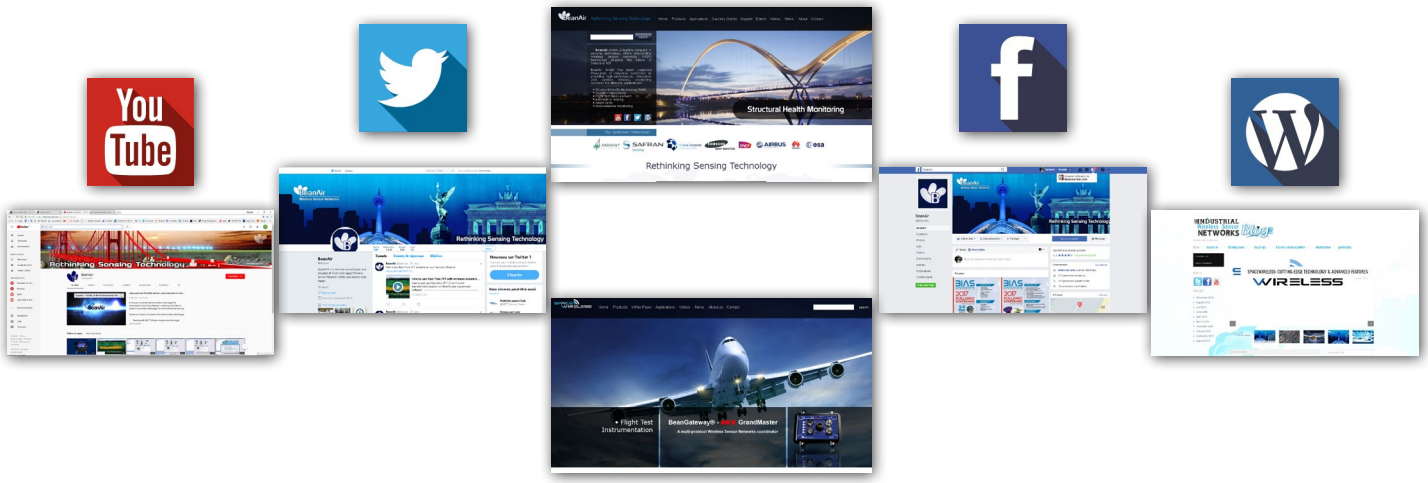

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