

BeanDevice® 2.4GHZ HI-INC XRANGE

HIGH PERFORMANCE WIRELESS IOT INCLINOMETER SENSOR | TILT, INCLINATION, SLOPE MONITORING

PRODUCT VIDEO



APPLICATION VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



STEP FILE



SmartSensor



2year  
Warranty

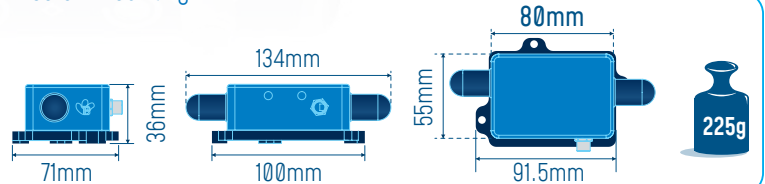
MADE IN GERMANY



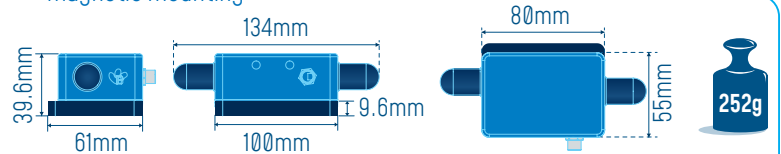
R 001A-08148



screw mounting



magnetic mounting



MAIN FEATURES



• High precision bi-axis inclinometer with great measurement repeatability ( $\pm 0.005^\circ$  for bi-axis  $\pm 15^\circ$  version, and  $\pm 0.006^\circ$  for bi-axis  $\pm 30^\circ$  version)



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



• Embedded data logger : up to 8 million data points (with events dating)



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



• Waterproof IP67 casing (Nema 6)



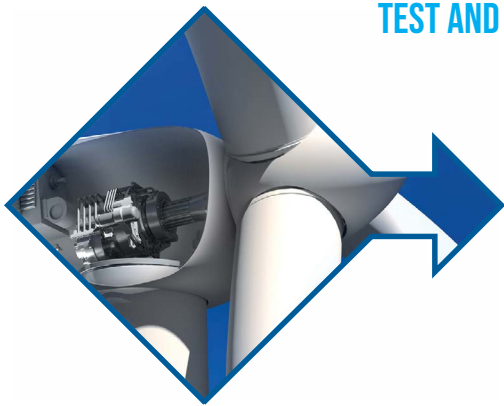
• Integrated Lithium-Ion battery charger

**BeanDevice® 2.4GHZ HI-INC XRANGE**

**APPLICATIONS**

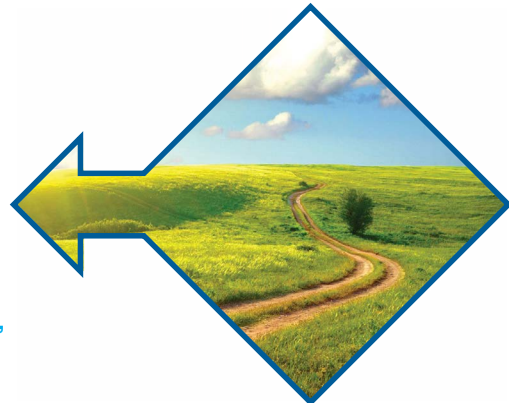


**STRUCTURAL HEALTH MONITORING**



**TEST AND MEASUREMENT**

**CONDITION MONITORING**



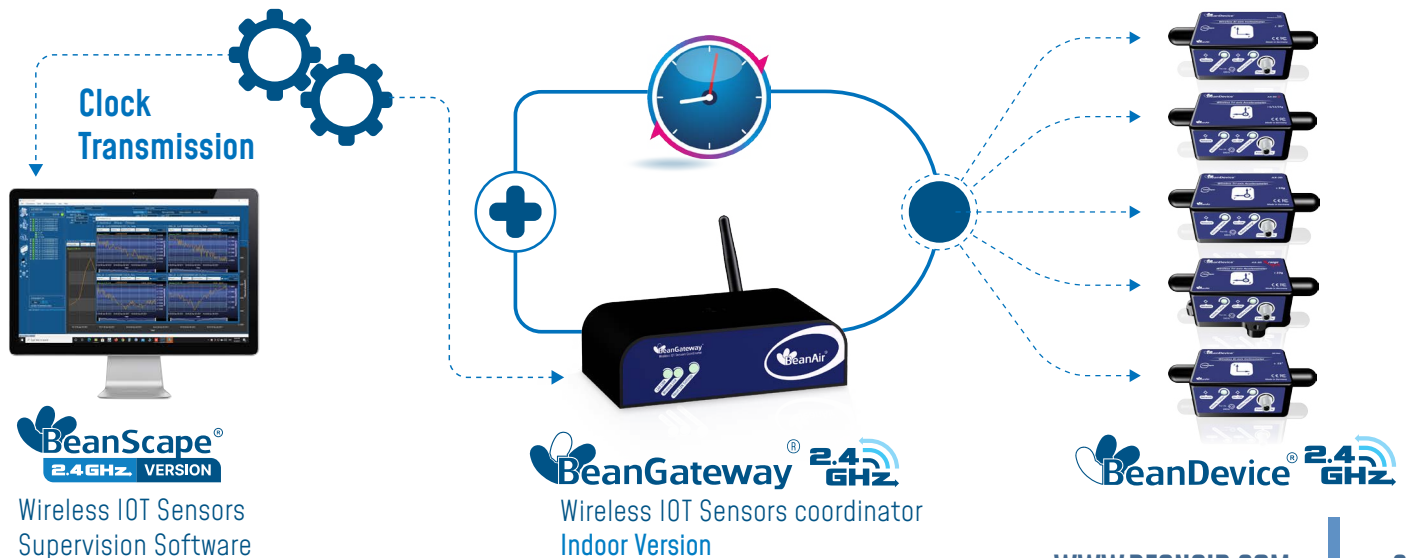
**LAND SURVEYING**



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 Network ( $\pm 2.5$ ms of accuracy between each wireless IIOT sensor) and contributes to enhance user experience about correlation of remote sensing data and modal analysis.



## REMOTE CONFIGURATION & MONITORING

### BeanScape® 2.4GHz Basic

A powerful and versatile supervision software for managing your wireless sensors

The **BeanScape® 2.4GHz** allows the user to view and manage all the data transmitted by the **BeanDevice® 2.4GHz HI-INC XRange**. Thanks to the OTAC (Over-the-Air configuration) function, users can remotely configure the **BeanDevice® 2.4GHz HI-INC XRange**.

A versatile wireless inclinometer with different data acquisitions mode:

- **Low Duty Cycle Data Acquisition mode (LDCDA)** : Data acquisition is immediately transmitted by radio. Transmission frequency can be configured from the **BeanScape® 2.4GHz** software from 1s to 24h.
- **Survey Mode**: An alarm notification is transmitted when a threshold is reached. A powerful alarm management tool available on the **BeanScape® 2.4GHz** software allows the user to configure alarm threshold and to generate automatic alarm notification by email. A “heart beat” notification is frequently transmitted, and keeps the user informed about its current status.
- **Streaming Mode** : All measured data are transmitted by packet within a continuous flow at 60 samples per second maximum



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 XRange** 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%



BeanDevice® 2.4GHZ HI-INC XRANGE

EMBEDDED DATA LOGGER UP TO 8 MILLION DATA POINTS

The BeanDevice® 2.4GHz HI-INC XRange 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 XRange :

- LowDutyCycle Data Acquisition
- Survey
- Streaming packet

EXAMPLE : TILT MONITORING ON A BRIDGE

- In standalone operation, the BeanDevice® 2.4GHz INC X-Range 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.



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-XR-PS-MO

MR – Measurement Range	PS - Power Supply	MO - Mounting Option
30B : bi-axial $\pm 30^\circ$	RB : Internal rechargeable battery	SCM - Screw Mounting Lid
	XT : External Power supply	MM - Magnetic Mounting Lid

Example 2: **BND-2.4 GHZ-HI-INC-30B-XR-RB-SCM** High performance wireless Bi-axis inclinometer with  $\pm 30^\circ$  measurement range, external power supply, Screw Mounting

### SENSOR SPECIFICATIONS

Inclinometer Technology	Accurate and low power MEMS technology
Measurement resolution (Bandwidth 10 Hz)	0.001°
Noise density	0.0004 °/√Hz
Sensor precision (full scale, @ 25°C, Static Measurement Mode every 2s)	$\pm 0.006^\circ$ for bi-axis $\pm 30^\circ$ version
Offset temperature dependency (temperature range -25°C to +85°C)	$\pm 0.002^\circ/\text{C}$
Sensitivity temperature dependency (temperature range -25°C to +85°C)	$\pm 0.005\%/\text{C}$ with temperature compensation
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 Hardware filter	Butterworth 5th order filter – cut-off frequency : 1 Hz to 100 Hz remotely programmable (BeanScape®)

**TECHNICAL SPECIFICATIONS**

**CONFIGURABLE SETTINGS FROM THE BEANSCOPE® 2.4GHZ SOFTWARE**

Data Acquisition mode (SPS = sample per second)	<b>Static Data Acquisition:</b> Low Duty Cycle Data Acquisition (LDCDA) and Alarm Mode (based on alarm thresholds). Measurement heartbeat 1s to 24 hour
Sampling Rate (in streaming and S.E.T. mode)	Minimum: 1 SPS Maximum: 100 SPS on each axis
Alarm Threshold	Three-level alarms : Alert < Action < Alarm
Programmable cut-off frequency (Anti-aliasing filter)	1 – 100 Hz
Power Mode	Battery saver mode & Active power mode (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	500 m in Line-Of-Sight 30-100 m in Non-Line-of-Sight
Antenna	Omnidirectional radome antenna with antenna diversity Gain : 3 dBi Waterproof IP67

**EMBEDDED DATA LOGGER**

Storage capacity	up to 8 millions data points
Wireless data downloading	20 minutes to download the full memory (average time)

**TIMESYNC FUNCTION : CLOCK SYNCHRONIZATION OVER THE WIRELESS IOT SENSORS**

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



## TECHNICAL SPECIFICATIONS

### ENVIRONMENTAL AND MECHANICAL

Casing	Aluminum AL6061 & Waterproof casing <ul style="list-style-type: none"> <li>• Dimensions in mm (LxWxH): 100 x 71 x 36 (without Radome antennas, with mounting eyelet)</li> <li>• Weight (with internal battery) : 225g (screw mounting) 252g (magnetic mounting)</li> </ul>
IP   NEMA Rating	IP67   Nema 6
Base plate	<ul style="list-style-type: none"> <li>• Aluminum black anodized AL 7075 with rugged three-point-mounting</li> <li>• Screw Mounting Option: the device should be mounted on a flat and smooth surface with 3 screws, dimension M5. Mounting torque 5 ±1Nm</li> <li>• Magnetic Mounting Option: the device should be mounted on a steel surface.</li> </ul>
Shock resistance	150g during 50 ms
Operating Temperature	<b>RB : Internal rechargeable battery</b> -40 °C to +60 °C <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>

### POWER SUPPLY

Integrated battery charger	Integrated Lithium-ion battery charger with high precision attery monitoring : <ul style="list-style-type: none"> <li>• Overvoltage/Overcurrent/Short-Circuit/ Undervoltage protection</li> <li>• Battery Temperature monitoring</li> </ul>
Current consumption @3.3V	<ul style="list-style-type: none"> <li>• During data acquisition : 30 to 40 mA</li> <li>• During Radio transmission : 80 mA @ 18 dBm</li> <li>• During Battery Saver Mode : &lt; 30 µA</li> </ul>
External power supply	8-28VDC with reverse polarity protection
Rechargeable battery	High density Lithium-Ion rechargeable battery with a capacity of 2.2Ah with polyswitch protection

### INCLUDED ACCESSORIES

- 1x Magnet to Power ON/Power OFF the device
- 1x M8 Cap for Power Supply

TECHNICAL SPECIFICATIONS

OPTIONAL ACCESSORIES AND SERVICES

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 efficiency solar panel with Solar charging controller and Lead-acid battery Ref : X-SOL-5W-M8-2M
Bracket Mounting	90° Bracket for BeanDevice (Xrange smartsensor) with 4 x M5 screws + Locknut Ref : SMART-BRACK-MNT
External Primary Cell in a Waterproof IP67 Casing	Waterproof IP67 battery box for long-term monitoring applications IP67 Battery Holder Battery Pack with 3 x C size primary cell, Li-SOCL2 Lithium Primary cell 3.6VDC Type 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 Ref : CERT-CAL-SMART

BEANDEVICE® 2.4GHZ HI-INC XRANGE FRONT VIEW



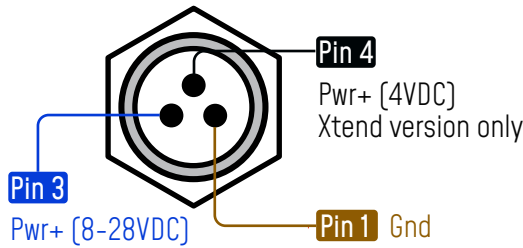
Product specifications are subject to change without notice.  
Contact Beanair for latest specifications.



**BeanDevice® 2.4GHZ HI-INC XRANGE**

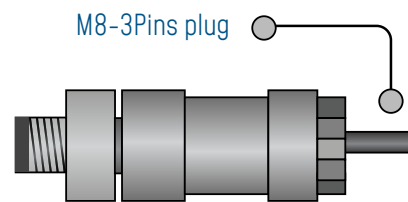
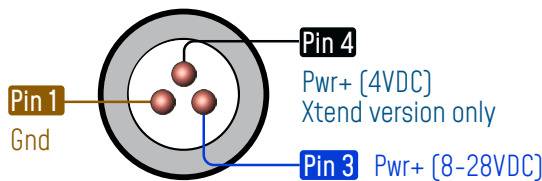
**EXTERNAL POWER SUPPLY WIRING CODE**

**M8 Socket [A-Coding] - Pin Assignment**



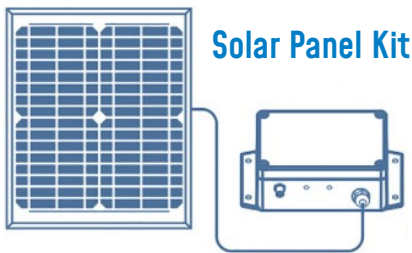
Interface Name	M8 Pin assignment	Wire Color [A-coding]
Power Supply 8-28VDC	<b>PIN 3</b>	Blue
Power Supply 4VDC [available on Xtend version only]	<b>PIN 4</b>	Black
Ground	<b>PIN 1</b>	Brown

**M8 Plug [A -Coding] - Pin Assignment**



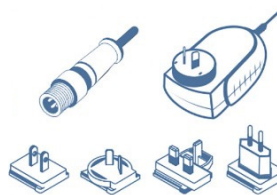
Do not power PIN4 and PIN3 at the same time, you will damage your Beandevic

**OPTIONS AND ACCESSORIES**



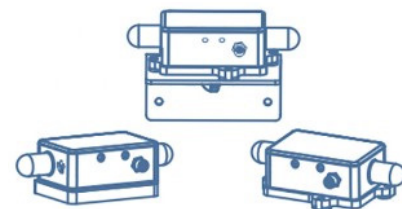
**Solar Panel Kit**

High efficiency solar panel with solar charging controller and Lead-acid battery  
Ref: X-SOL-SLP-VOUT-CL



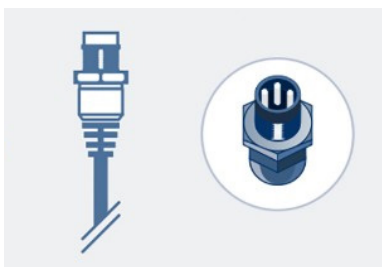
**External Power-Supply**

Wall plug-in, Switchmode power Supply 12V @ 1,25A with sealed M8 Plug [ IP67/Nema 6]  
Ref: M8-PWR-12V



**Mechanical Mounting Options**

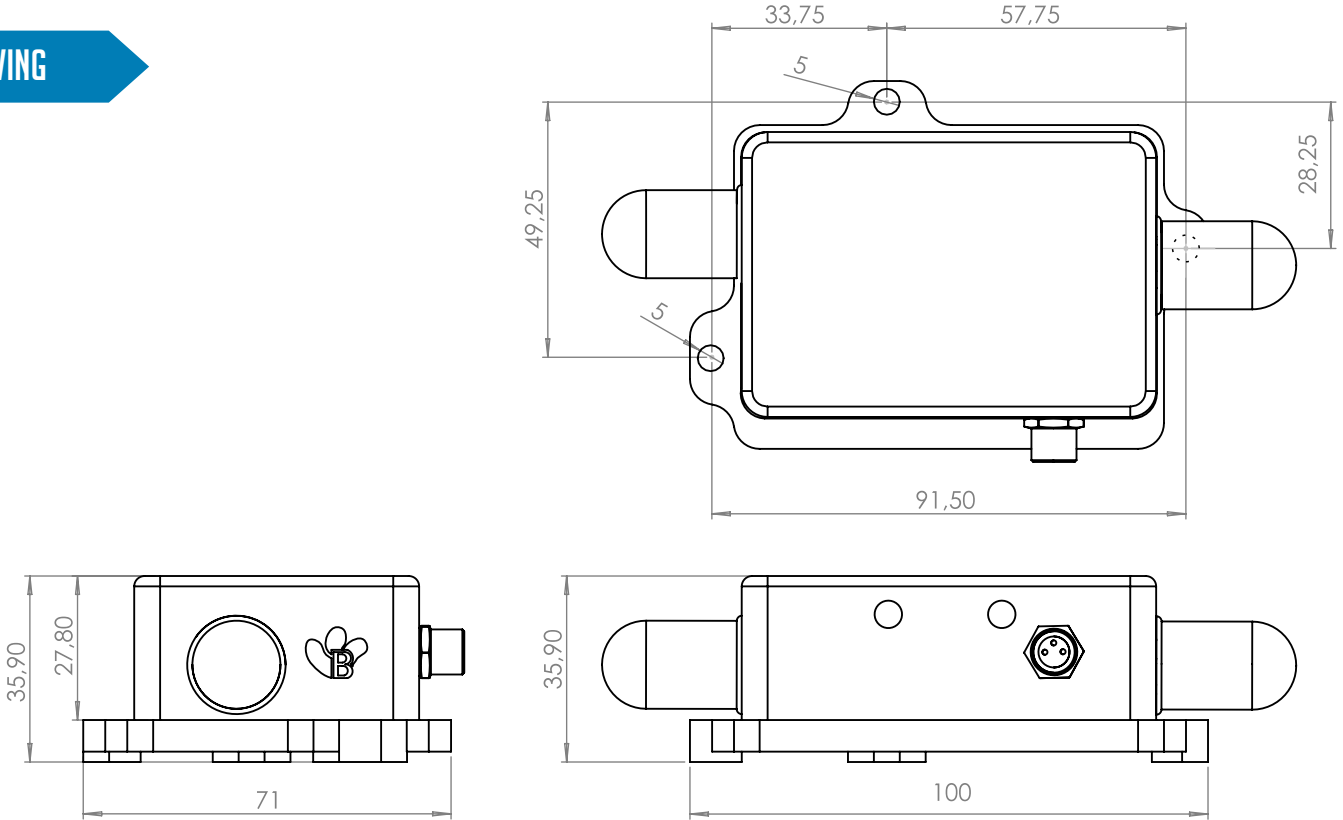
- 90° Bracket for BeanDevice [ Xrange smartsensor ] with 4 x M5 screws + Locknut  
Ref: SMART-BRACK-MNT
- Magnetic Mounting Lid



**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

**DRAWING**



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