

BeanDevice® 2.4GHZ HI-INC

WIRELESS INCLINOMETER SENSOR | TILT / INCLINATION / SLOPE MONITORING

PRODUCT VIDEO



APPLICATION VIDEO



USER GUIDE



QUICK START



MECHANICAL DRAWING



STEP FILE



SmartSensor

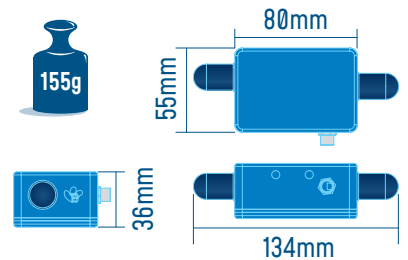


2year
Warranty

MADE IN GERMANY



001A-08148



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 (± 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

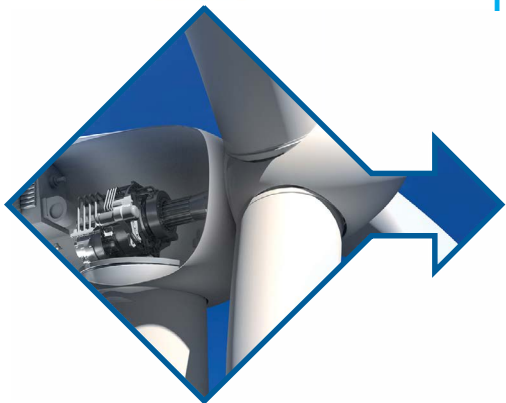
APPLICATIONS



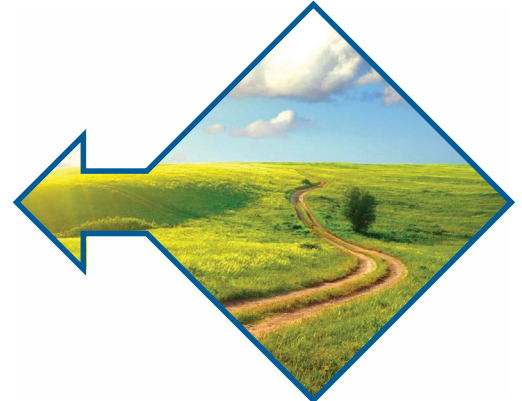
STRUCTURAL HEALTH MONITORING



TEST AND MEASUREMENT



CONDITION MONITORING



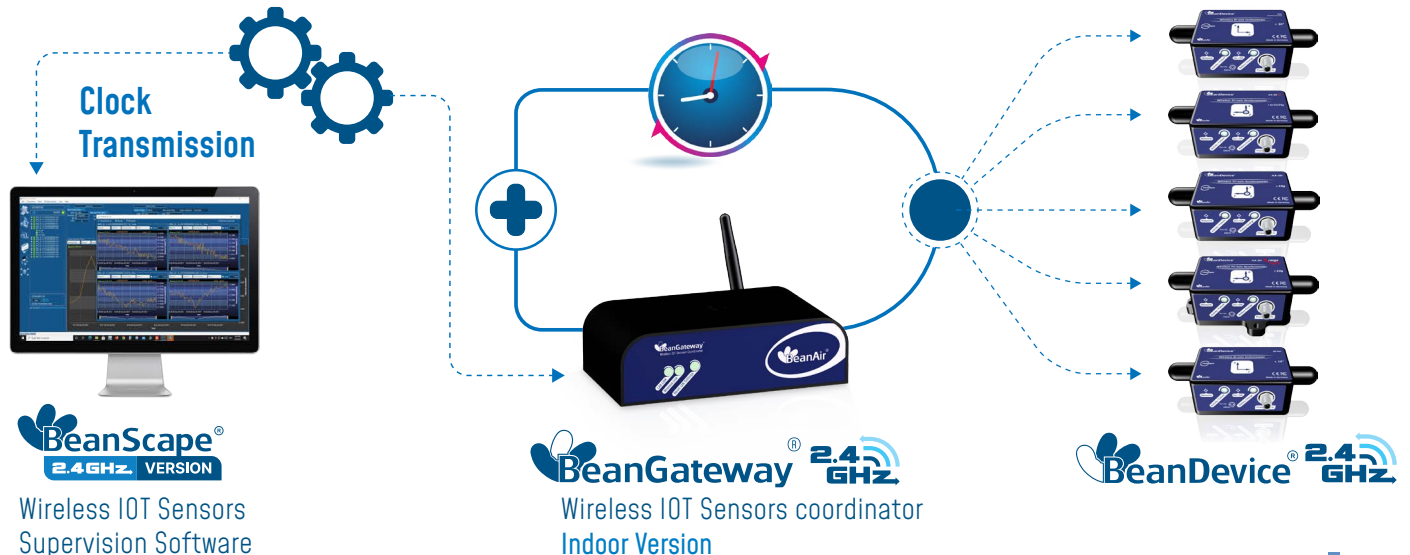
LAND SURVEYING



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 IOT Sensors (± 2.5 ms of accuracy between each wireless IOT sensor) and contributes to enhance user experience about correlation of remote sensing data and modal analysis.



BeanDevice® 2.4GHZ HI-INC

REMOTE CONFIGURATION & MONITORING

BeanScape® Basic

The **BeanScape®** 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



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 IOT 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%.



BeanDevice® 2.4GHZ HI-INC

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

Example 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

Measurement Repeatability (full scale, @ 25°C, Static Measurement Mode every 2s)

$\pm 0.05^\circ$ for bi-axis $\pm 15^\circ$ version
 $\pm 0.06^\circ$ for bi-axis $\pm 30^\circ$ version

Offset temperature dependency

± 0.002 °/°C

Sensitivity temperature dependency

± 0.005 %/°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 Hardware filter

Butterworth 5th order filter – cut-off frequency : 1 Hz to 100 Hz remotely programmable (BeanScape®)

CONFIGURABLE SETTINGS FROM THE BEANSCAPE® 2.4GHZ SOFTWARE

Data Acquisition mode (SPS = sample per second)

Static Data Acquisition: 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)

TECHNICAL SPECIFICATIONS

RF SPECIFICATIONS

Wireless Protocol Stack	Ultra-Low-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 1 millions data points
Wireless data downloading	3 minutes to download the full memory (average time)

TIMESYNC FUNCTION : CLOCK SYNCHRONIZATION OVER THE WIRELESS IOT SENSOR

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

ENVIRONMENTAL AND MECHANICAL

Casing	Aluminum AL6061 & Waterproof casing Dimensions in mm (LxWxH): 80x55x36 mm Weight (battery included) : 155g
IP NEMA Rating	IP67 Nema 6
Shock resistance	100g during 50 ms
Operating Temperature	RB : Internal rechargeable battery -40 °C to +60 °C XT : External Power Supply -40 °C to +75 °C during battery discharge
Norms & Radio Certifications	<ul style="list-style-type: none"> • CE Labelling Directive R&TTE (Radio) ETSI EN 300 328 • FCC (North America) • ARIB STD-T66 Ver 3.6 • ROHS - Directive 2002/95/EC

TECHNICAL SPECIFICATIONS

POWER SUPPLY

Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery monitoring : <ul style="list-style-type: none"> • Overvoltage/Overcurrent/Short-Circuit/Undervoltage protection • Battery Temperature monitoring
Current consumption @3.3V	<ul style="list-style-type: none"> • During data acquisition : 30 to 40 mA • During Radio transmission : 80 mA @ 18 dBm • During Battery Saver Mode : < 38 µA
External power supply	8-28VDC with reverse polarity protection
Rechargeable battery	High density Lithium-Ion rechargeable battery with a capacity of 950 mAh

INCLUDED ACCESSORIES

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

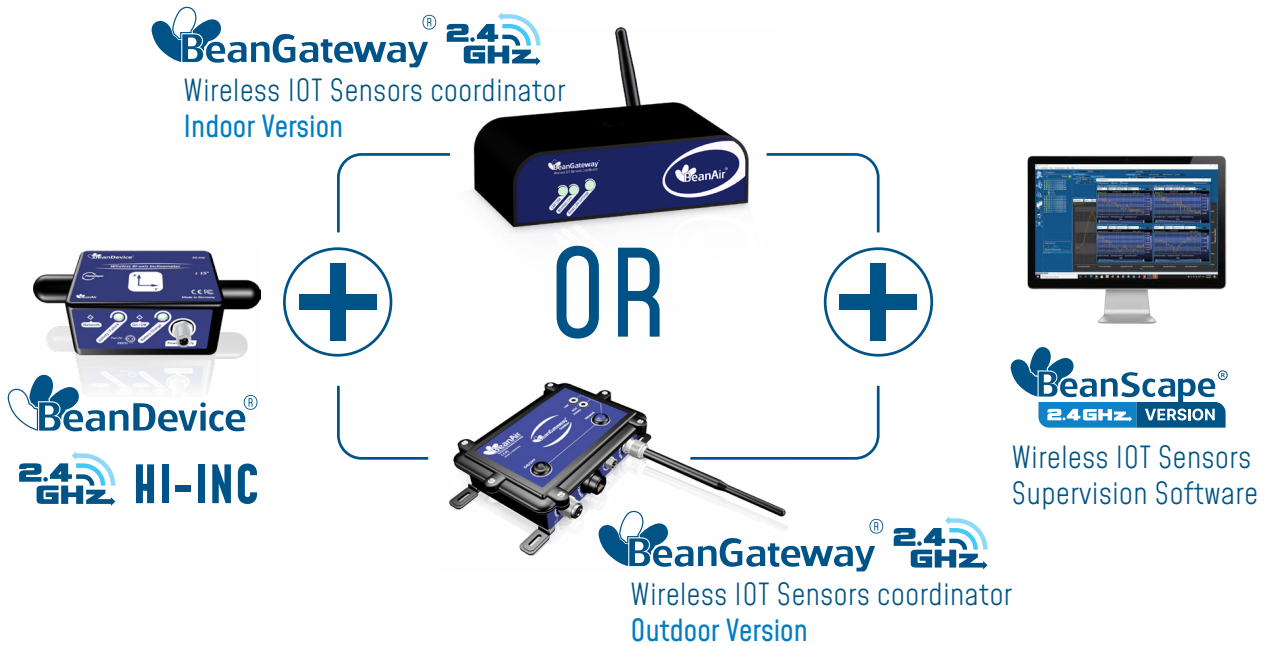
OPTIONAL ACCESSORIES AND SERVICES

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
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

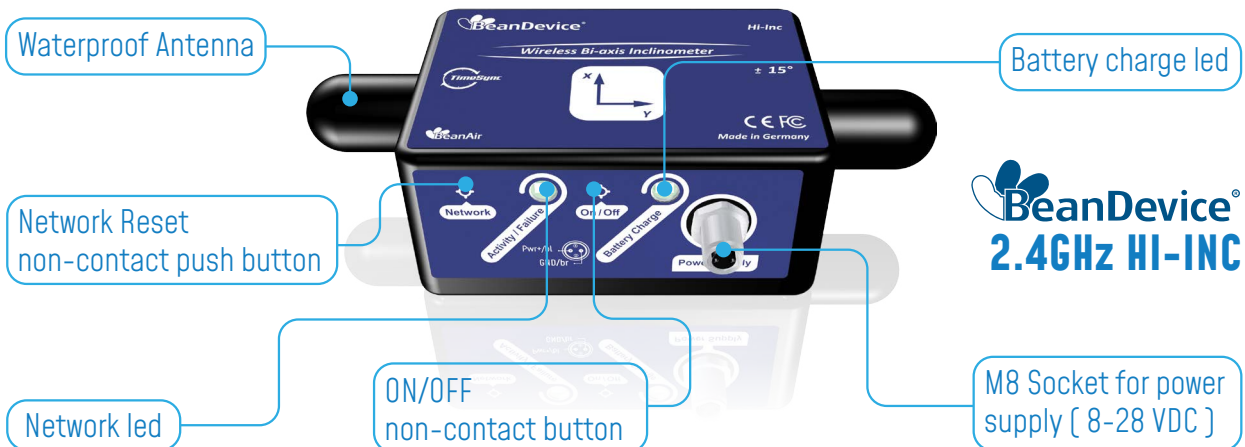
GETTING STARTED WITH A WIRELESS IIOT SENSORS

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



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

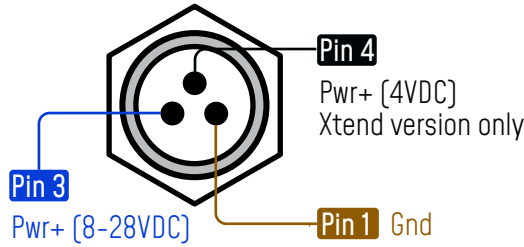


Product specifications are subject to change without notice.
 Contact Beanair for latest specifications.

BeanDevice® 2.4GHZ HI-INC

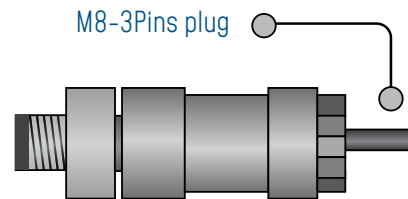
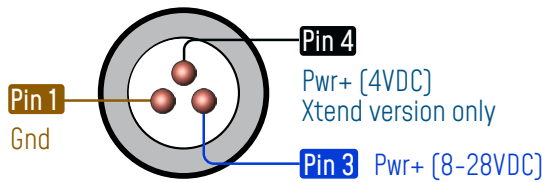
EXTERNAL POWER SUPPLY WIRING CODE

M8 Socket [A-Coding] - Pin Assignment



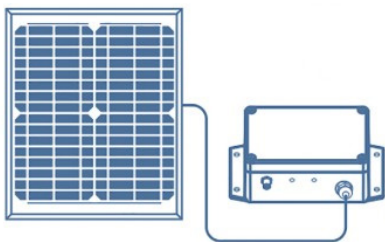
Interface Name	M8 Pin assignment	Wire Color [A-coding]
Power Supply 8-28VDC	PIN 3	Blue
Power Supply 4VDC [available on Xtend version only]	PIN 4	Black
Ground	PIN 1	Brown

M8 Plug [A -Coding] - Pin Assignment



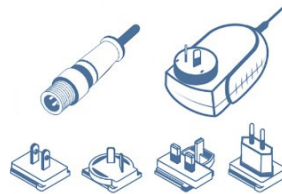
Do not power PIN4 and PIN3 at the same time, you will damage your Beandevic

OPTIONS AND ACCESSORIES



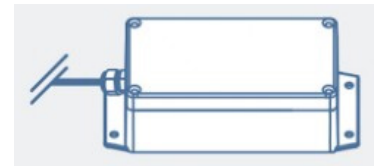
Solar Panel Kit

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



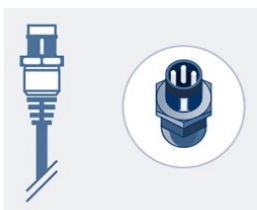
External Power-Supply

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



External Battery Pack

Waterproof IP67 battery box for long-term monitoring applications
Ref: PRIM-XTEND



M8 extension cable for external power supply

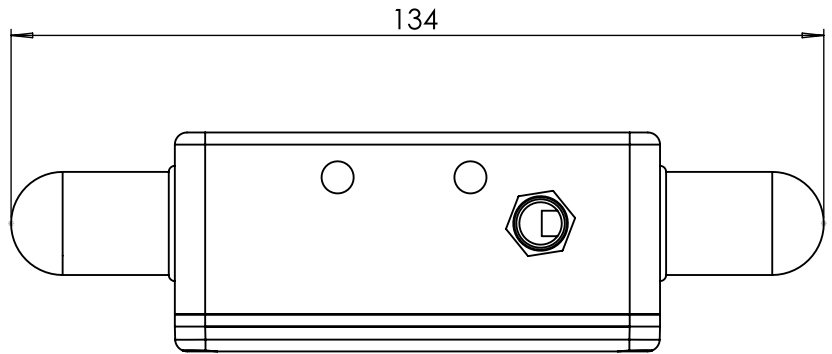
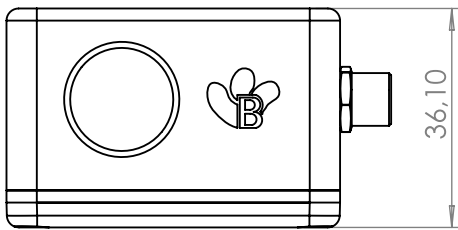
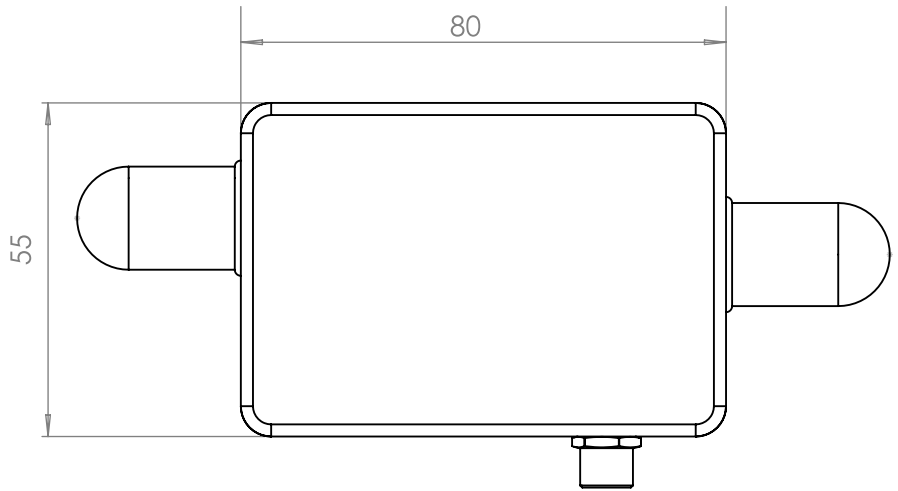
Molded cable with M8-3pins male plug
Material: PVC with shield protection
IP Rating : IP67 | Nema 6

Cable length: 2 meters , Ref: CBL-M8-2M
Cable length : 5 meters, Ref: CBL-M8-5M
Cable length: 10 meters, Ref: CBL-M8-10M

BeanDevice® 2.4GHZ HI-INC

DRAWING

“No screw mounting option, this device should be glue mounted or use a **tape/cable-tie**”
If you need screw mounting option, please choose version: [HI-INC-XR-SCM](#)



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