

WIRELESS INCLINOMETER SENSOR | TILT / INCLINATION / SLOPE MONITORING

PRODUCT VIDEO



APPLICATION VIDEO



USER GUIDE



QUICK START



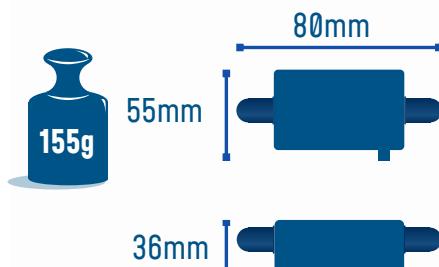
MECHANICAL DRAWING



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)



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



- Waterproof IP67 casing (Nema 6)



- Time-synchronized wireless sensor networks (± 2.5 ms of accuracy)



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

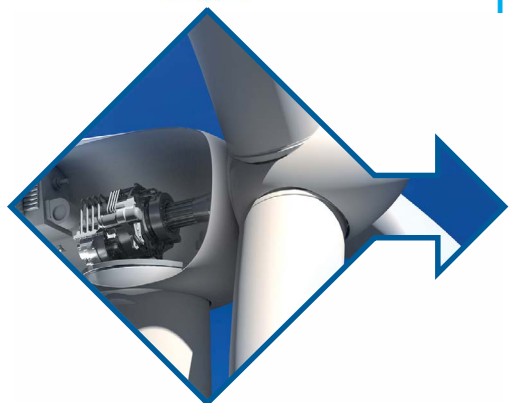


- Integrated Lithium-Ion battery charger

APPLICATIONS



STRUCTURAL HEALTH MONITORING



TEST AND MEASUREMENT



CONDITION MONITORING



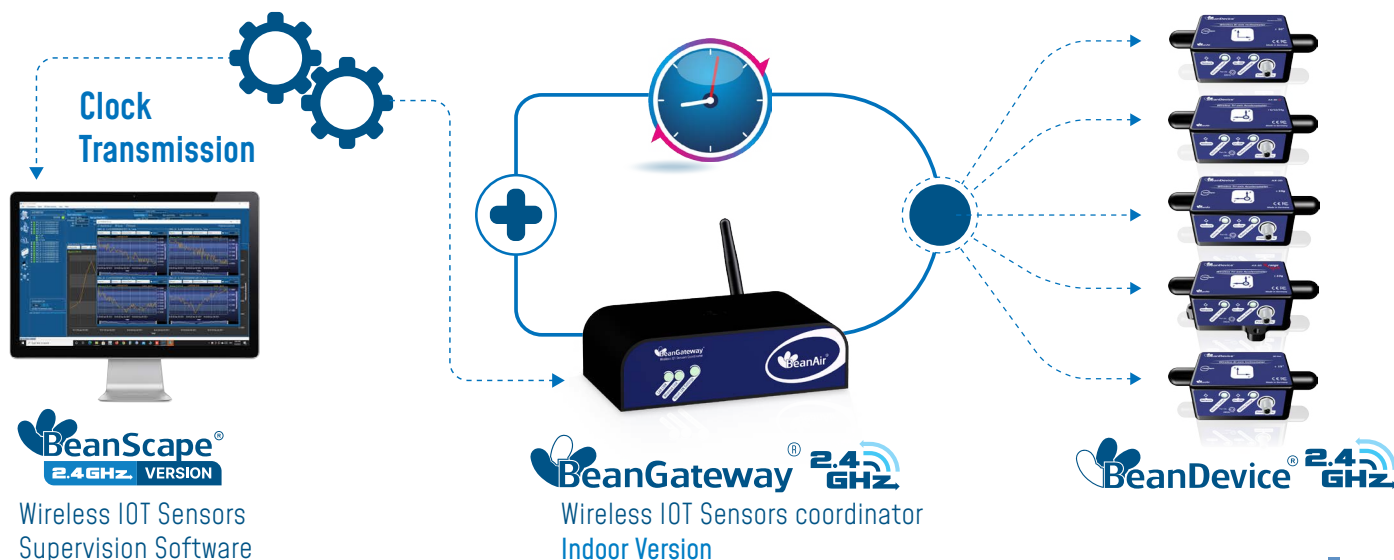
LAND SURVEYING



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.



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%.



EMBEDDED DATA LOGGER UP TO 1 MILLION DATA POINTS

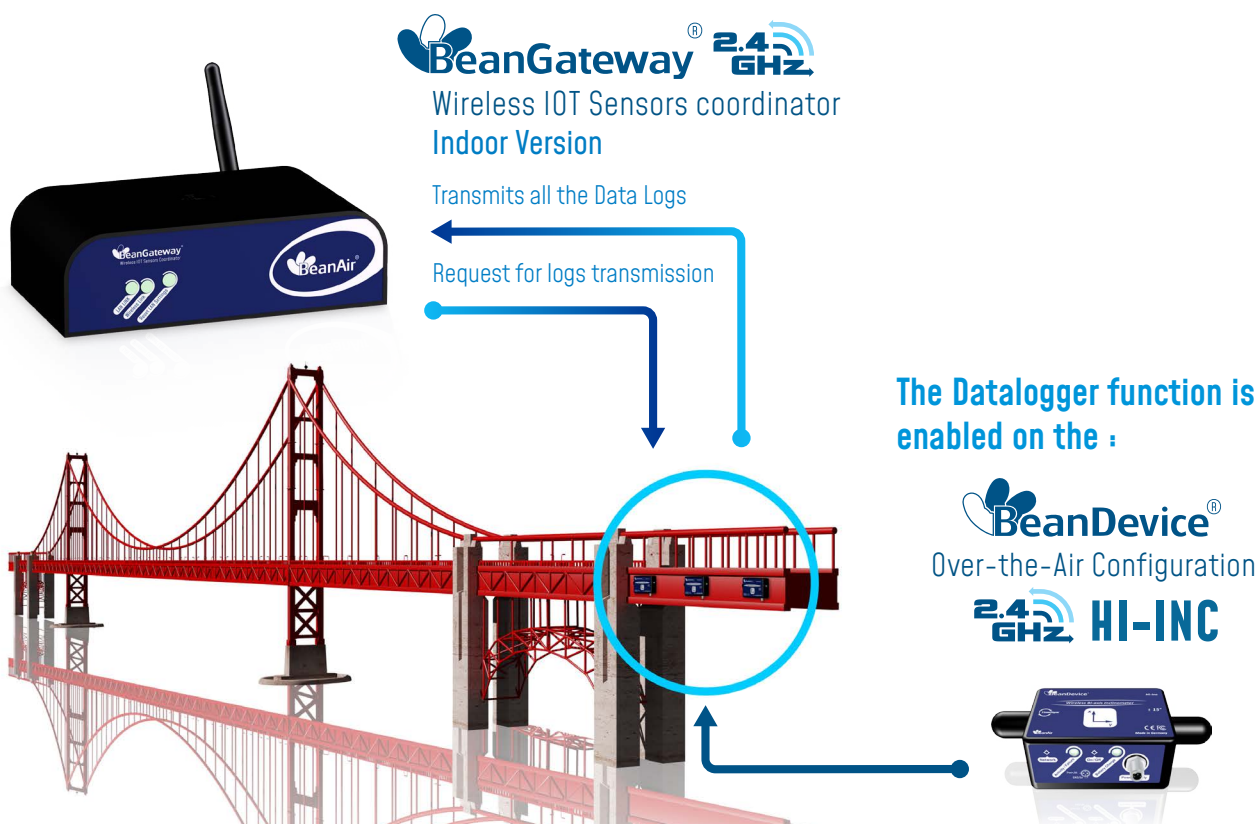
The **BeanDevice® 2.4GHz HI-INC** integrates an embedded datalogger, which can be used to log data when a Wireless IOT Sensors can not be easily deployed on your site. All the data acquisition are stored on the embedded flash and then transmitted to the **BeanGateway® 2.4GHz** when a Wireless IOT Sensors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



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)	$\pm 0.06^\circ$ for bi-axis $\pm 30^\circ$ version
Offset temperature dependency	$\pm 0.002^\circ/\text{C}$
Sensitivity temperature dependency	$\pm 0.005\%/^\circ\text{C}$
Long term stability (@23°C)	$< 0.004^\circ$
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 Technology	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 (In Transmission Mode)	High Gain Antenna : 400-500m (L.O.S), 60-120m (N.L.O.S.) Integrated Radome Antenna : 200-300m (L.O.S), 30-60m (N.L.O.S.)
Antenna	Antenna diversity : High Gain Antenna : 2 x N-Type Antenna 5dBi , IP67 Radome Antenna : 2 x Antenna 1.9 dBi , 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) without Antenna: 80x55x36 mm Weight : 200g with Integrated Radome Antenna 400g with HG Antenna (antenna included)
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

POWER SUPPLY

Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery monitoring : • Overvoltage/Overcurrent/Short-Circuit/ Undervoltage protection • Battery Temperature monitoring
Current consumption @3.3V	• 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 IEC-61000-4-2: ESD 30kV(Air), 30kV (Contact) Surge protection > 28VDC (600W during 10us max)
Rechargeable battery	2 Ah, Lithium-Polymer battery

INCLUDED ACCESSORIES

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

OPTIONAL ACCESSORIES AND SERVICES

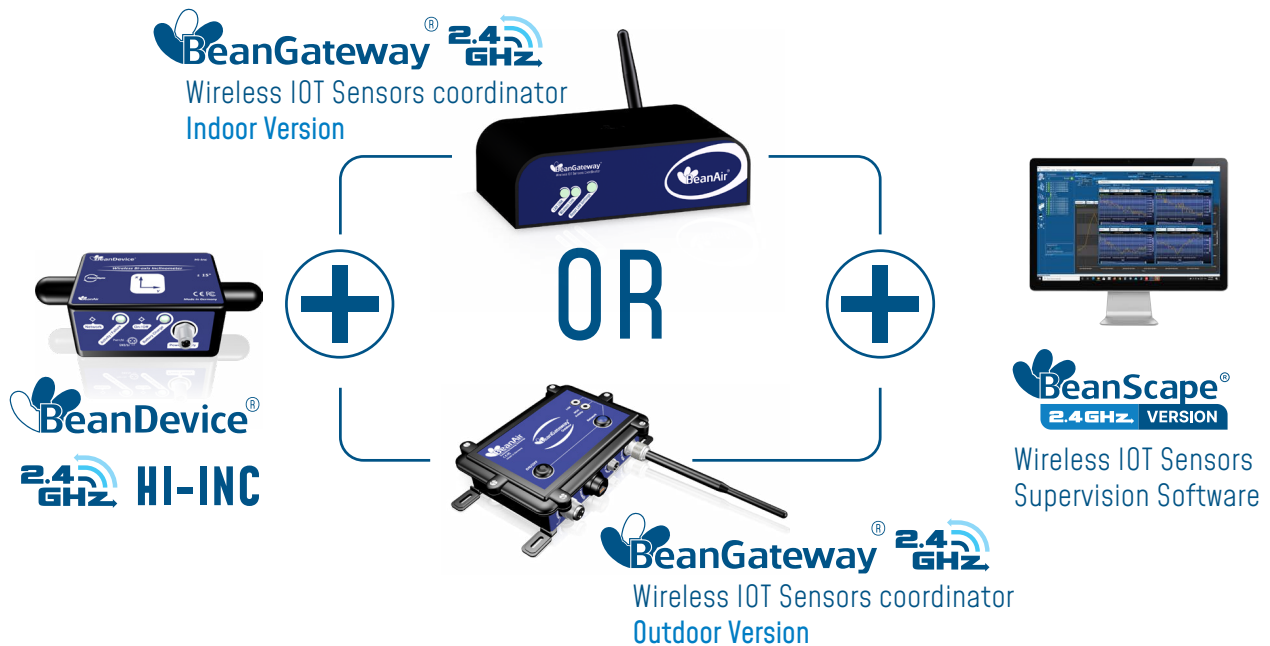
External Power Supply	Wall plug-in, Switchmode power Supply 12V @ 1.25A with sealed M8 Plug (IP67/Nema 6) Ref: M8-PWR-12V
Solar Panel Kit (compatible with External Power Supply version only)	Ref.: X-SOL-7AH-20W-4V-5M for XT version Ref.: X-SOL-7AH-20W-12V-5M for RB version Ref: X-SOL-14AH-20W-4CH-4V-5M for XT version Ref: X-SOL-14AH-20W-4CH-12V-5M for RB version Ref: X-SOL-14AH-80W-4CH-4V-5M for XT version Ref: X-SOL-14AH-80W-4CH-12V-5M for RB version
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

500m L.O.S conditions is reached:

- Beangateway is positioned in Line Of Sight toward sensor (no obstacles, no radio interferences) with High Gain Antenna, with a Height of 3 meters minimum. 26dBm High Gain Directional Antenna is used on gateway side.
- On sensor side : Radome Antenna should point to Vertical Direction for better Coverity

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 Beandevide autonomy in Streaming and Streaming Packet Mode

BEANDEVICE® 2.4GHZ HI-INC FRONT VIEW

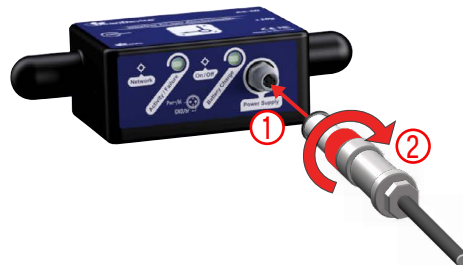
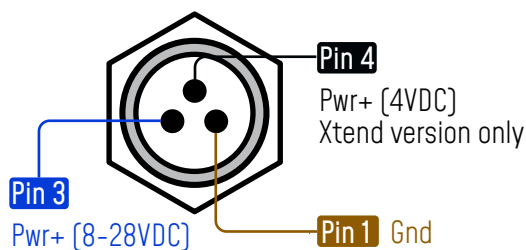


Product specifications are subject to change without notice.
 Contact Beanair for latest specifications.

BeanDevice® 2.4GHZ HI-INC

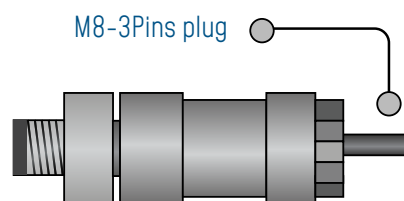
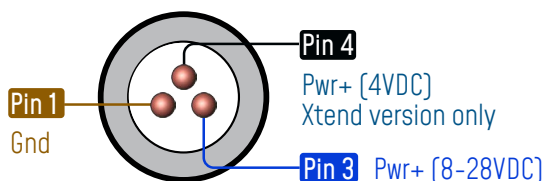
EXTERNAL POWER SUPPLY WIRING CODE

M8 Socket [A-Coding] - Pin Assignment



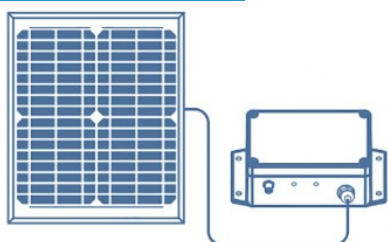
Interface Name	M8 Pin assignment	Wire Color [A-coding]
Power Supply 8-28VDC	PIN 3	Blue
Power Supply 4VDC [available on Xtend version only]	PIN 4	Black
Ground	PIN 1	Brown

M8 Plug [A -Coding] - Pin Assignment



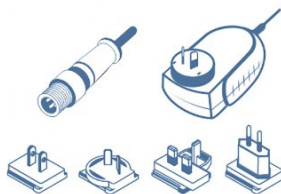
Do not power PIN4 and PIN3 at the same time, you will damage your Beandevic

OPTIONS AND ACCESSORIES



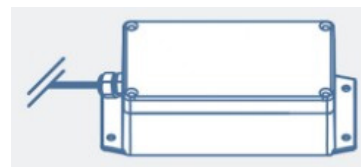
Solar Panel Kit

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



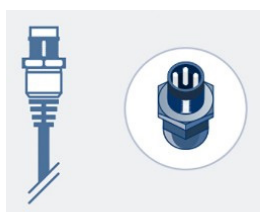
External Power-Supply

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

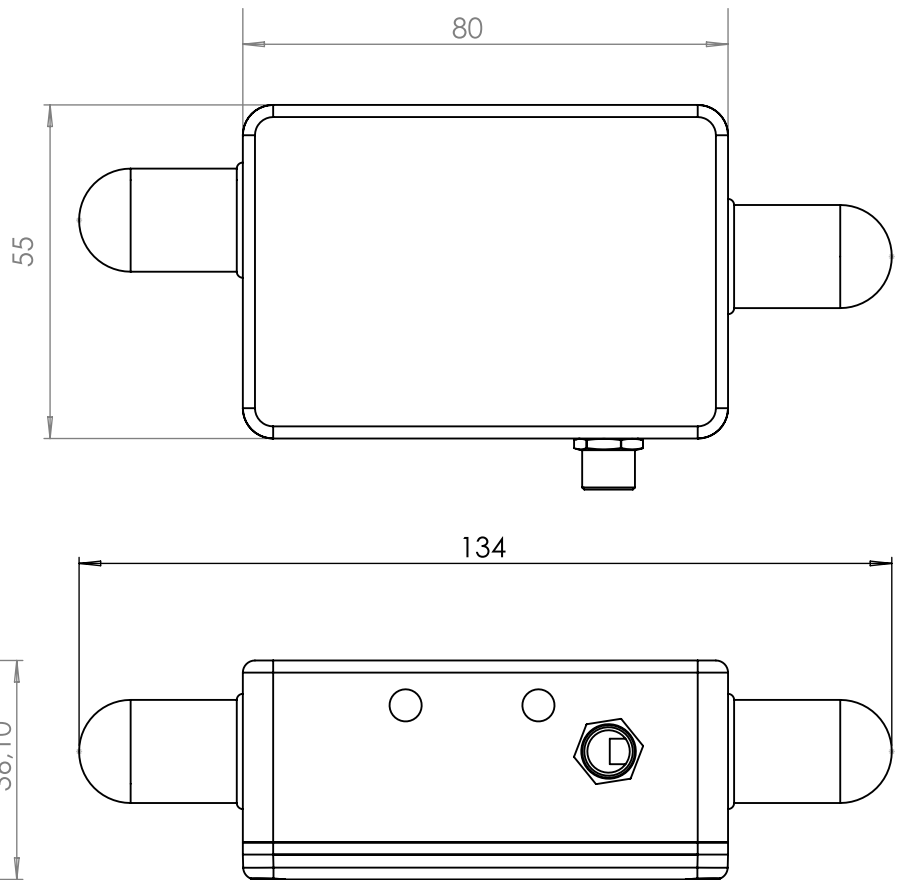
Cable length: 2 meters , Ref: CBL-M8-2M
Cable length : 5 meters, Ref: CBL-M8-5M
Cable length: 10 meters, Ref: CBL-M8-10M

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](#)



CONTACT US

Headquarter:

Buchholzer Straße 65, 13156
Berlin, Germany

Email:

info@beanair.com

Phone number:

+493066405051



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Above given technical data are only for information purpose.

BeanAir® Sensors has right to change product specifications without notice.