BeanAir
WIRELESS IOT SENSORS

2.4 GHz

BeanDevice® 2.4GHZ HI-INC-SR

WIRELESS IOT TRI AXIS INCLINOMETER SENSOR | SCALABLE MEASURING RANGE

PRODUCT VIDEO

USER GUIDE

QUICK START

MECHANICAL DRAWING

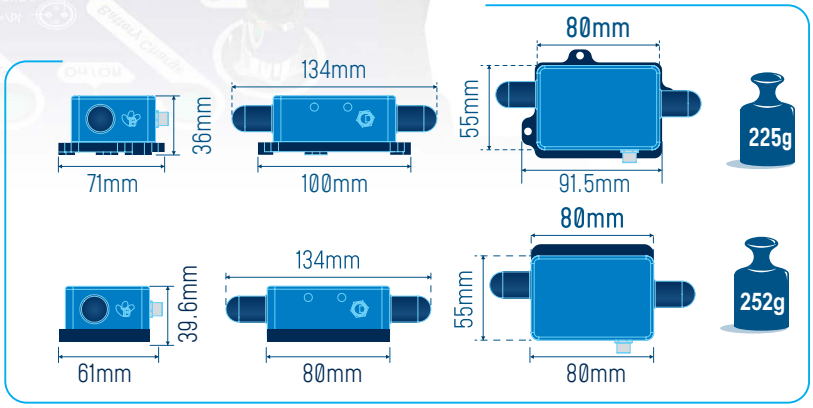
STEP FILE

SmartSensor

2year Warranty

MADE IN GERMANY

CE FC R 001A-08148

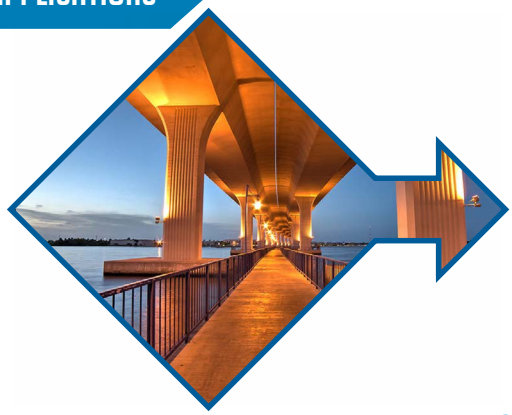


MAIN FEATURES

- MEMS inclinometer with scalable measuring range (±10° and ±90°)
- High resolution 0.0055° and a High precision (±0.01° for ±10° range, ±0.02° for ±90° range)
- Embedded data logger : up to 8 million data points (with events dating)
- Waterproof IP67 casing (Nema 6)
- Time-synchronized wireless sensor networks (±2.5ms of accuracy)
- Excellent radio link relying on the radio antenna diversity developed by Beanair®
- Integrated Lithium-Ion battery charger

BeanDevice® 2.4GHZ HI-INC-SR

APPLICATIONS



STRUCTURAL HEALTH MONITORING

CONSTRUCTION SITE

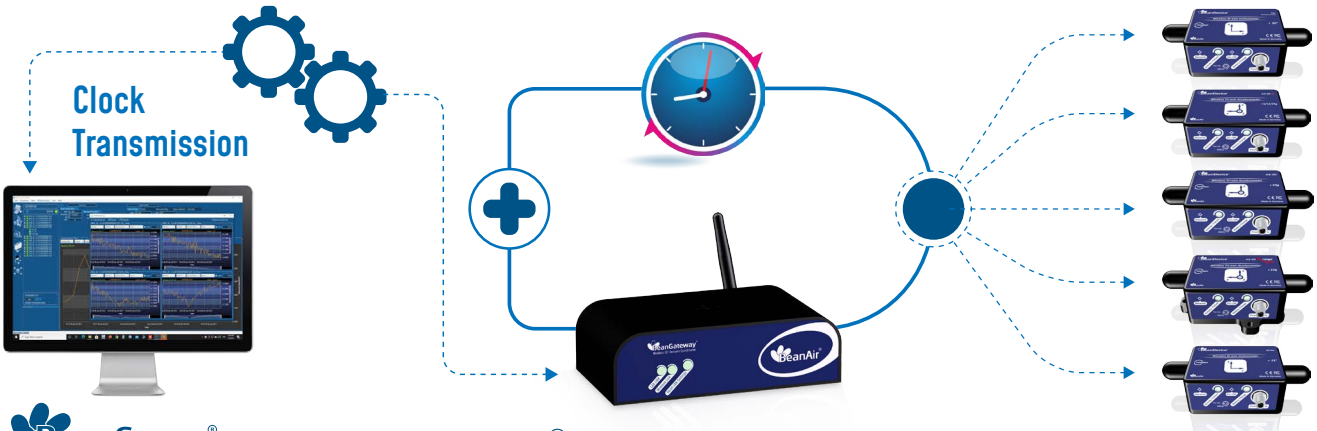
CARGO SHIP

RAIL TRACK MONITORING

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

TIME-SYNCHRONIZED WIRELESS IOT SENSORS

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



BeanScape® 2.4GHz VERSION
Wireless IOT Sensors Supervision Software

BeanGateway® 2.4GHz
Wireless IOT Sensors coordinator Indoor Version

BeanDevice® 2.4GHz

BeanDevice® 2.4GHZ HI-INC-SR

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 -SR

Thanks to the OTAC (Over-the-Air configuration) function, users can remotely configure the BeanDevice® 2.4GHz HI-INC-SR.

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 managementt 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 IOT sensors show their limits in harsh industrial environment, the BeanDevice® 2.4GHz HI-INC-SR 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-SR

EMBEDDED DATA LOGGER UP TO 8 MILLION DATA POINTS

The BeanDevice® 2.4GHz HI-INC-SR 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-SR :

- LowDutyCycle Data Acquisition
- Survey
- Streaming packet

EXAMPLE : TILT MONITORING ON A BRIDGE

- In standalone operation, the BeanDevice® 2.4GHz HI-INC-SR 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 "

BeanDevice® 2.4GHZ HI-INC-SR

TECHNICAL SPECIFICATIONS

PRODUCT REFERENCE

BND-2.4GHZ-HI-INC-SR-MR-PS-MO

MR – Measurement Range	PS - Power Supply	MO - Mounting Option
10T : Tri-axial ±10°/ ±90°	RB : Internal rechargeable battery	SCM - Screw Mounting Lid
	XT : External power supply 4VDC (Compatible with X-SOLAR-4VDC and PRIM-XTENDER)	MM - Magnetic Mounting Lid

Example 1: BND-2.4GHZ-HI-INC-SR-10T-SCM, High performance wireless Tri-axis inclinometer with ±10°/±90° measurement range, internal rechargeable battery, Screw mounting
Example 2: BND-2.4GHZ-HI-INC-SR-10T-XT-MM, High performance wireless Tri-axis inclinometer with ±10°/±90° measurement range, external power supply, Magnetic Mounting

SENSOR SPECIFICATIONS

Inclinometer Technology	Accurate and low power MEMS technology
Scalable Measuring Range	uer-seletctable range ±10° or ±90°, with automatic range adjustment depending on the application
Sensor resolution	0.0055°
Noise density	for ±10° range : 0.0007 °/√Hz on Y Axis, 0.008 °/√Hz on X, Z Axis for ±90° range : 0.0012 °/√Hz on all axis
Sensor precision (full scale, @ 25°C, Static Measurement Mode every 2s)	±0.01° for ±10° measurement range ±0.018° for ±90° measurement range
Offset temperature dependency (temperature range –25°C to +85°C)	±0.0008 °/°C
Sensitivity temperature dependency (temperature range –25°C to +85°C)	±0.1 %
Offset LifeTime Drift (@25°C)	±0.08°
Sensor frequency Response (-3 dB)	DC to 10 Hz for ±10° measurement range DC to 40 Hz for ±90° measurement range (Automatic Range) DC to 70 Hz for ±90° measurement range
Calibration	Factory calibrated for ±10° range and ±90° with calibration settings backed up on the sensor Flash memory. Calibration method used : Back-to-back calibrated with a reference sensor. Sensors can be re-calibrated by the user.

INTEGRATED TEMPERATURE SENSOR

Temperature Range	-40°C to +75°C
Measurement resolution	±0.06°C
Sensor Precision	±1°C

BeanDevice® 2.4GHZ HI-INC-SR

TECHNICAL SPECIFICATIONS

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 Dynamic data acquisition(not available on devices with ref. extension XT): Streaming and S.E.T. (Streaming with Event Trigger) Mode
Sampling Rate (in streaming and S.E.T. mode)	Minimum: 1 SPS Maximum: 20 SPS on each axis , for ±10° measurement range (Static and Auto Range) , for ±90° measurement range Auto Range) , Maximum: 80 SPS on each axis , for ±90° measurement range (Static Range)
Alarm Threshold	Three-level alarms : Alert < Action < Alarm
Scalable Mesurement Range	±10° , ±90° and automatic ±10°/±90°
Power Mode	Battery saver mode & Active power mode (Active Power Mode is not available on -XT version)

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

BeanDevice® 2.4GHZ HI-INC-SR

TECHNICAL SPECIFICATIONS

ENVIRONMENTAL AND MECHANICAL	
Casing	Aluminum AL6061 & Waterpoof casing • Dimensions in mm (LxWxH): 100 x 71 x 36 (without Radome antennas, with mounting eyelet) • Weight (with internal battery) : 225g (screw mounting) 252g (magnetic mounting)
IP | NEMA Rating	IP67 | Nema 6
Base plate	• Aluminum black anodized AL 7075 with rugged three-point-mounting • Screw Mounting Option: the device should be mounted on a flat and smooth surface with 3 screws, dimension M5. Mounting torque 5 ±1Nm • Magnetic Mounting Option: the device should be mounted on a steel surface.
Shock resistance	150g 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	• 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 attery monitoring : • Overvoltage/Overcurrent/Short-Circuit/ Undervoltage protection • Battery Temperature monitoring
Current consumption @3.3V	• During data acquisition : 30 to 40 mA • During Radio transmission : 55 mA @ 18 dBm • During Battery Saver Mode : < 30 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

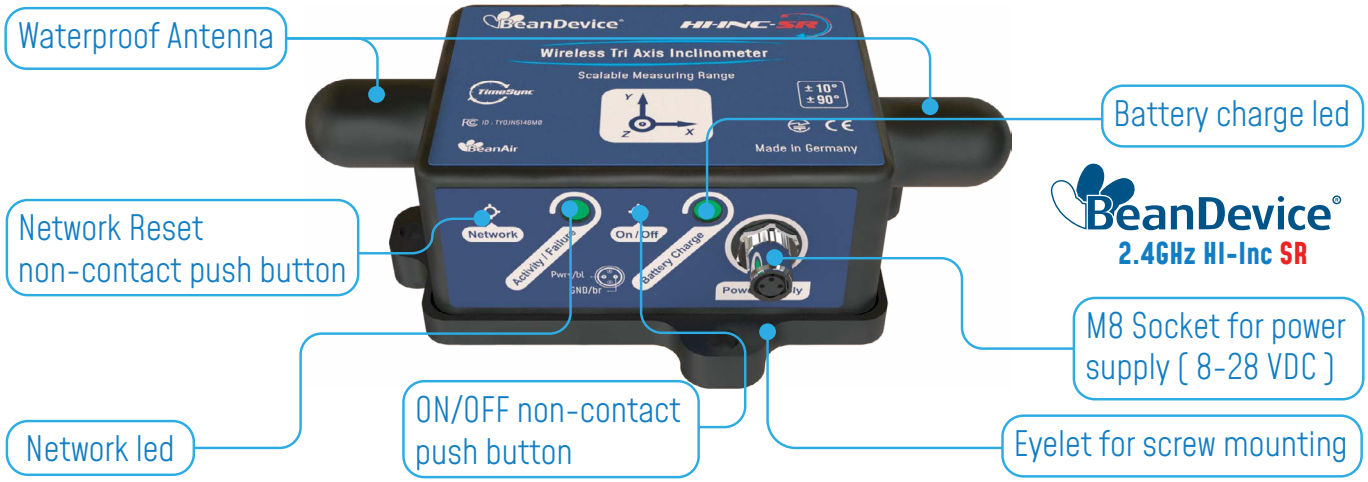
BeanDevice® 2.4GHZ HI-INC-SR

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-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
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 6500mAh Li-SOCL2 Lithium Primary cell (Capacity 3x 6.5Ah) Ref : PRIM-XTENDER Compatible with : BND-2.4GHZ-HI-INC-SR-10T-XT-MM & BND-2.4GHZ-HI-INC-SR-10T-XT-SCM
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

BATTERY LIFE WITH FOR DIFFERENT MEASUREMENT CYCLE	
Battery Saver mode Enabled, Measurement Cycle every minute	8 months
Battery Saver mode Enabled, Measurement Cycle every 5 minutes	13 months
Battery Saver mode Enabled, Measurement Cycle every hour	6 months
Battery Saver mode disabled, Streaming mode 20 Samples / second	72 hours

BeanDevice® 2.4GHZ HI-INC-SR

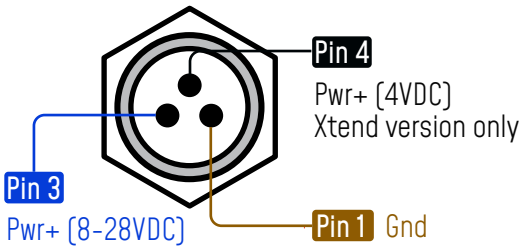
BEANDEVICE® 2.4GHZ HI-INC SR

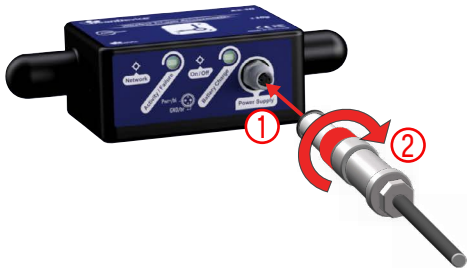


Product specifications are subject to change without notice.
Contact Beanair for latest specifications.

EXTERNAL POWER SUPPLY WIRING CODE

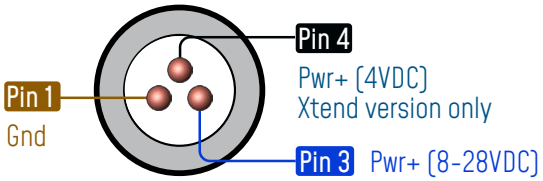
M8 Socket (A-Coding) - Pin Assignation

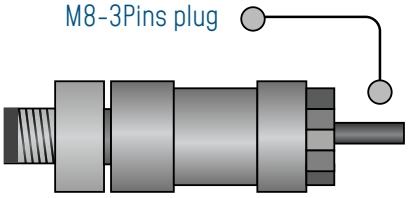




Interface Name	M8 Pin assignation	Wire Color (A-coding)
Power Supply 8-28VDC	PIN 3	Blue
Power Supply 4VDC (available on Xtend version only)	PIN 4	Black
Ground	PIN 1	Brown

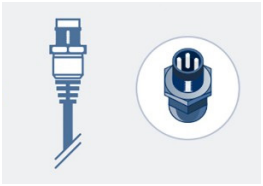
M8 Plug (A –Coding) - Pin Assignation





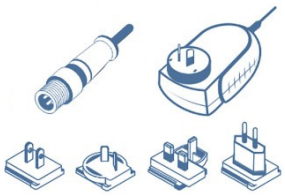
Do not power PIN4 and PIN3 at the same time, you will damage your Beandevice

OPTIONS AND ACCESSORIES



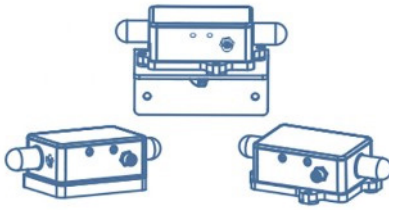
M8 extension cable for external power supply

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



External Power-Supply

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

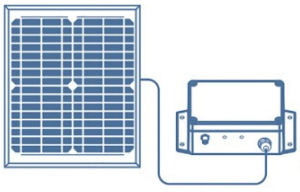


Mechanical Mounting Options

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

Solar Panel Kit

Solar charging controller and Lead-acid battery
Ref.: X-SOL-7AH-20W-1CH-4V-5M for XT version
Ref.: X-SOL-7AH-20W-1CH-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



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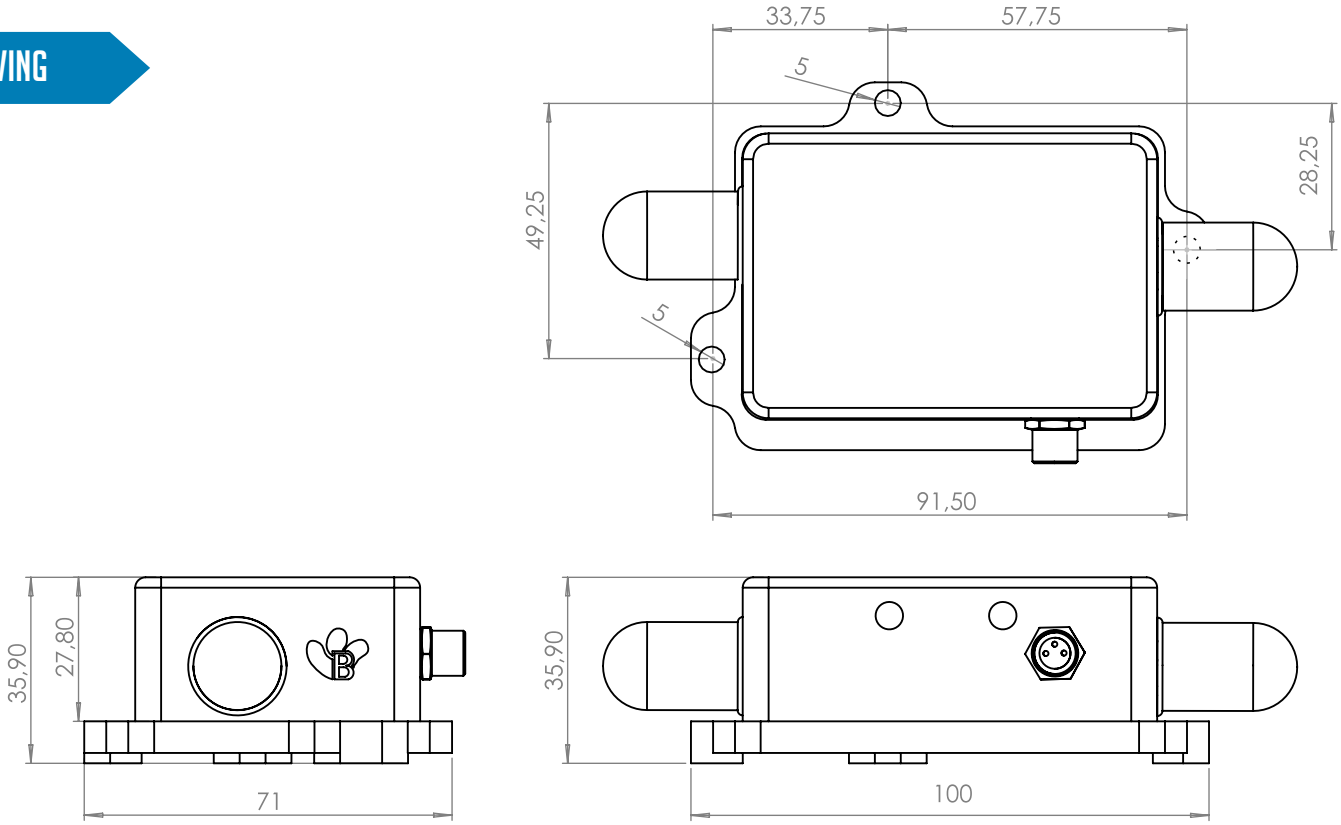
DRAWING



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