SATEVIS

QUICK START

USER GUIDE

MECHANICAL DRAWING

STEP FILE

Tri-Axis INCLINOMETER SENSOR

KOMPAKT

Scalable Measuring Range

±10°
±85°

USB CONNECTOR-WIRING CODE

PIN 1 5VDC
PIN 2 DATA-
PIN 3 DATA+
PIN 4 NOT USED
PIN 5 NOT USED
PIN 7 GND

Y
Z X

MADE IN GERMANY

CE FC

ON OFF

ALPHA-INC KOMPAKT

Scalable Measuring Range (±10° and ±85°)

DATASHEET

IOT

IP 67

1 ⟩ Main Features

High resolution 0.0055° and a High precision (±0.01° for ±10° range, ±0.02° for ±85° range)

LoRaWAN® Protocol: 10km Radio Range

MEMS inclinometer with scalable measuring range (±10° and ±85°)
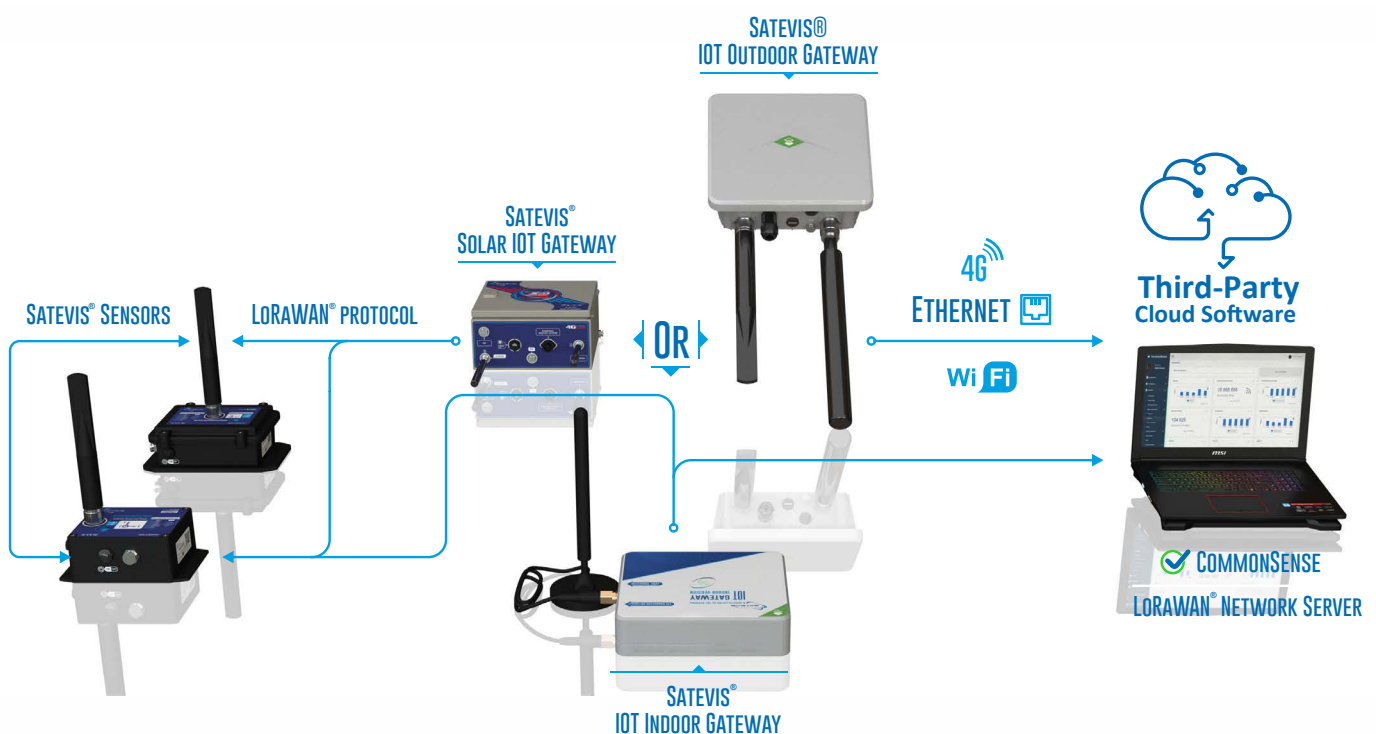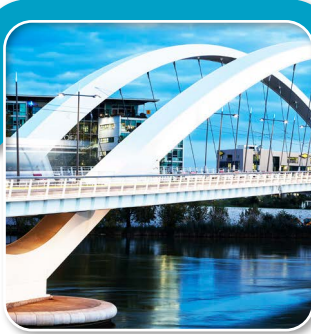
Waterproof IP67 casing (Nema 6)

Excellent radio link.

Integrated battery pack

2 ⟩ How it Works ?

Satevis®
IOT Outdoor Gateway

Satevis®
Solar IOT Gateway

Satevis® Sensors

LoRaWAN® protocol

OR

4G
ETHERNET
Wi Fi

Third-Party
Cloud Software

Satevis®
IOT Indoor Gateway

CommonSense
LoRaWAN® Network Server

3 APPLICATIONS

BRIDGE

RAILWAY SLEEPERS

CRANE
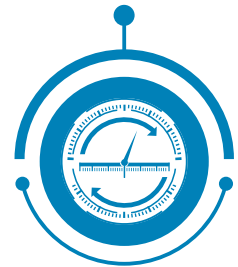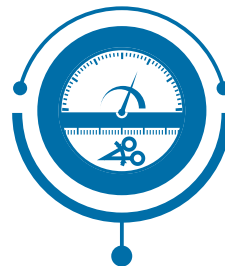
TUNNEL

CONDITION MONITORING
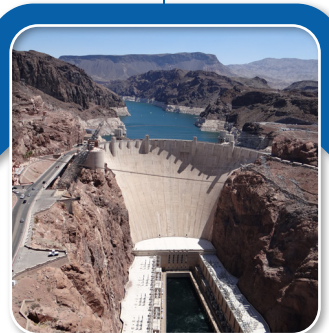
LAND SURVEYING

STRUCTURAL HEALTH MONITORING

TEST AND MEASUREMENT

CARGO SHIP

DAM

ANTENNA BASE STATION

CONSTRUCTION SITE

4 ⟨ Non-Contact Buttons and LEDS description

"Hello!" function helps the field operator to check the sensor installation & configuration

Caption1: After installing the Alpha-Inc inclinometer , the field operator can check at any moment if the sensor is working properly.

Caption2: By Holding the magnet on the 'Hello!' label for more than 10s, the sensor wakes-up and transmits to the Lorawan network the data measurement followed by the system diagnostic (battery status and network quality).
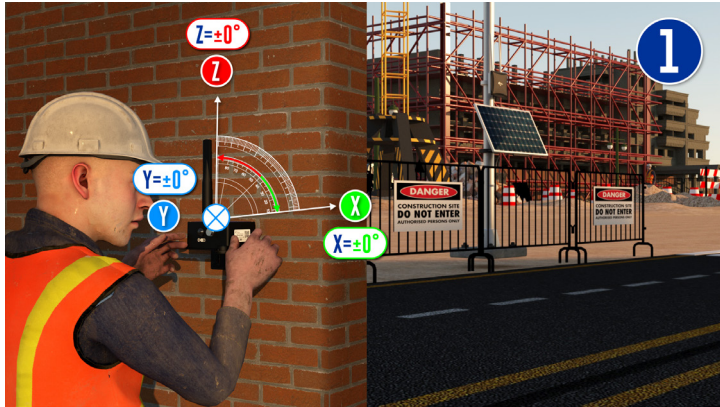

Caption3: The Activity Led blinks in green color, confirming that a data measurement is transmitted to the Lorawan network.

Caption4: The field operator can check on Satevis® Cloud software (or a third-party cloud software) if his sensor is working properly.

Sensor zeroing function simplifies the sensor installation

Caption1: Even if an angle bracket is used, it's sometimes difficult to bring a zero-offset on both X and Y axis (in the case if Z axis is on the same direction than Earth Gravity).. In some cases, the field operator can not spend too much time on this task.

Caption2: To enable the sensor zeroing function, hold the magnet on 'Sensor Zeroing" Label for more than 10s.

Caption3: The Activity LED blinks in blue, the sensor zeroing starts on both X and Y axis . When this process is done, the Activity led will blink again in blue color and transmits a data measurement to the Lorawan® network. If the sensor zeroing process is not done correctly (the device is moving) the Activity Led will blink in Red color.

Caption4: The Sensor-zeroing process can be also done remotely from the cloud software.

5 < TECHNICAL SPECIFICATIONS

PRODUCT REFERENCE

SATEVIS-LORA-ALPHA-INC-KOMP-MR-PS-RP-AG

MR– Measurement Range: **10T** : tri-axis ±10°/±85°	**PS - Power supply :** **1CELL:** 1 x primary cell Lithium-Thionyl Chloride 3.6VDC - D Size cell 19Ah (Non rechargeable battery)
RP- Radio Power **LP** - Low Power Radio +14dBm	**AG - Antenna Gain** **AG-2dBi-868:** 2dBi Antenna for EU/IND Regions (Europe /India) **AG-5dBi-868:** 5dBi Antenna for EU/IND Regions (Europe /India) **AG-2dBi-915:** 2dBi Antenna for US/KR/AS/AU Regions (USA/KOREA/ASIA/AUSTRALIA) **AG-5dBi-915:** 5dBi Antenna for US/KR/AS/AU Regions (USA/KOREA/ASIA/AUSTRALIA)

Example 1: SATEVIS-LORA-ALPHA-INC-KOMP-10T-1CELL-LP-AG-2dBi-868

Tri-axis Wireless Inclinometer ±10°/±85° with LoraWan connectivity, Powered from 1 x primary cell, Low Power Radio, 2dBi Antenna 868Mhz

Example 2: SATEVIS-LORA-ALPHA-INC-KOMP-10T-1CELL-LP-AG-5dBi-915

Tri-axis Wireless Inclinometer ±10°/±85° with LoraWan connectivity, Powered from 1 x primary cell, Low Power Radio,5dBi Antenna 915MHz

CONFIGURABLE SETTINGS FROM CLOUD SOFTWARE

Javascript formatter code	Free Javascript fromatter code to accelerate the integration of Satevis sensors in your own cloud software : - Downlink formatter code (Alarm Threshold, Measurement mode....) - Uplink formatter code(Data measurement)
Data Acquisition mode	Different measurement mode are available: Low Duty Cycle Data Acquisition (LDCDA), Measurement heartbeat 20s to 24 hour Alarm measurement mode, Measurement heartbeat 10s to 24 hour
Alarm Threshold	Three levels of Alarm Thresholds Minor Alarm / Severe Alarm / Critical Alarm
Scalable Mesurement Range	±10° , ±85°

Satevis LINK SOFTWARE (from USB)

Configuration	Frequency Plan, AppEUI, AppKey
Sensor calibration	User Calibration

Firmware Upgrade (from USB)

Firmware Upgrade	Firmware upgrade through the USB with STCubeProgrammer (available on our FTP)

5 ❮ TECHNICAL SPECIFICATIONS

Inclinometer Sensor	
Inclinometer Technology	MEMS Technology
Scalable Measuring Range	user-seletctable range ±10° or ±85°, with automatic range adjustment depending on the application
Sensor resolution	0.0055° on full scale
Noise density	for ±10° range : 0.0007 °/√Hz on Y Axis, 0.008 °/√Hz on X, Z Axis for ±85° range : 0.0012 °/√Hz on all axis
Sensor precision (full scale, @ 25°C)	±0.01° for ±10° measurement range ±0.02° for ±85° measurement range
Sensor Accuracy (full scale, @ 25°C)	±0.015° for ±10° range ±0.02° for ±45° range ±0.04° outside ±45° range
Offset temperature dependency (temperature range −25°C to +85°C)	±0.006°/°C
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 ±85° measurement range
Calibration	Factory calibrated on 9 references point : 0° absolute, ±5° ,±10°, ±30° and ±45° with calibration settings backed up on the sensor Flash memory. Calibration method used : Back-to-back calibration with an accurate reference sensor.
Sensor Zeroing function	Sensor zeroing can be done after Satevis Sensor installation. User need to hold a magnet on the label " sensor zeroing" for approx. 10s, zero-offset is the performed on all sensor axis X/Y/Z

Power supply	
Integrated battery	Non-Rechargeable Lithium Thionyl Chloride D Size Capacity 19h , Max Voltage 3.6 Volts
Current consumption @ 3,3V	· During data acquisition : 15 to 20 mA · During Radio transmission : 35 mA @14 dBm · During Battery Saver Mode : < 11 µA
External power supply	USB Power 5VDC. When the device is powered from USB, the internal battery is disconnected from the power path.

5 TECHNICAL SPECIFICATIONS

RF Specifications	
LoRaWAN® Stack	LoRaWAN® V1.0.2 REVB / CLASS A
Activation Mode	OTAA only
LoRaWAN® Frequency Plan	Frequency Plan can be configured from USB: -Europe 868MHz - USA: 915MHz - Australia 915MHz - Asia 923MHZ - Korea 920MHz - India 865Mhz Important : Depending on the destination region, Satevis Device will be delivered with Antenna for 868MHZ Frequecies (Europe/India), or 915MH frequencies (USA/KOREA/ASIA/Ausrtalia)
TX Power	Low TX Power Radio: 14dBm @868/915MHz
Receiver Sensitivity	-136.5dBm sensitivity for SF12 with 125KHz BW
Link Budget	158dB
Maximum Radio Range	- 8-10 Km in L.O.S. / Rural Environment - 1-2 Km in NLOS/ Urban Environment
Antenna	Waterproof N-Type Omni Antenna, Gain 5 dBi or 2dBi / VSWR $\leqslant$ 2.0 Frequency range for AG-2dBi-868 and AG-5dBi-868 : 863-870 MHz Frequency range for AG-2dBi-915 and AG-5dBi-915 : 902-928 MHz Dimensions Ø22 x 64 mm for 2dBi Dimensions Ø22 x 180 mm for 5dBi

DataLogger / Recorder	
Datalogger Size	If 4 sensors Channels (Tri-Axis Inclinometer, 1 Internal Temperature) : 380 000 Log sessions per sensor channel If 6 sensors Channels (Example: Tri-Axis Inclinometer, 1 Internal Temperature, External Temperature, External Humidity) : 246 000 Log sessions per sensor channel
Logged Information	UTC Clock Data Measurement Monitoring Mode
Remote configuration from LNS	DataLogger Start/Stop/Erase
Download Method	From USB with Hypeterminal Software, CSV format

Wireless IOT Tri-Axis Inclinometer

Included accessories

1 x Battey Pack 3 x C-Size Cell - 6,5Ah (3S1P configuration)
1x Magnet for Sensor-Zeroing & Hello functions
2x M8 Cap for Power Supply & external optional sensor
1 x USB to M8 cable adapter, 2 meters length
1 x Self-amalgamating tape (25cm length)
1 x LoRaWAN® Antenna (see antenna options on reference builder)
1x Button Shield

Available functions

ON/OFF	Mechanical latching Push button
Hello	Transmits Data on user request , works with a magnet pointing to Hello label
Sensor Zeroing	sensor zeroing on user request , works with a magnet pointing to sensor zeroing label
Multi color LED	Green: network connection, data tranmsision Blue: Sensor zeroing successful/Hello Message Transmitted successfully

Environmental and Mechanical

|	
Casing	Aluminum & Waterpoof casing Dimensions in mm (LxWxH): 115x90x55 mm (without antenna) Weight : 700g
IP	NEMA Rating	IP67	Nema 6 / IP68 (M8 Connector cap mounted , self-fusing is used around antenna connector)
Shock resistance	100g during 50 ms
Mounting base	Screw mounting
Operating Temperature	-40°C to +75°C Sunshield should be used if the device is exposed to sun radiation from +68°C
Relative Humidity	0 to 98 %RH
Norms & Radio certifications	·CE Labelling Directive R&TTE (Radio) ETSI EN 300 328 ·FCC (North America) ·ARIB STD-T66 Ver 3.6 HS Code: 9031.80.20 EAR99 ROHS - Directive 2002/95/EC

Optional External sensors

Temperature and HumIdity sensor	Ref: B-TH-01-150-M8
Industrial Pressure sensor	Ref: SAT-EXT-TIR(available Q1-2025)
Industrial Water Level Sensor	Ref: SAT-EXT-WATER-LEVEL (available Q2-2025)

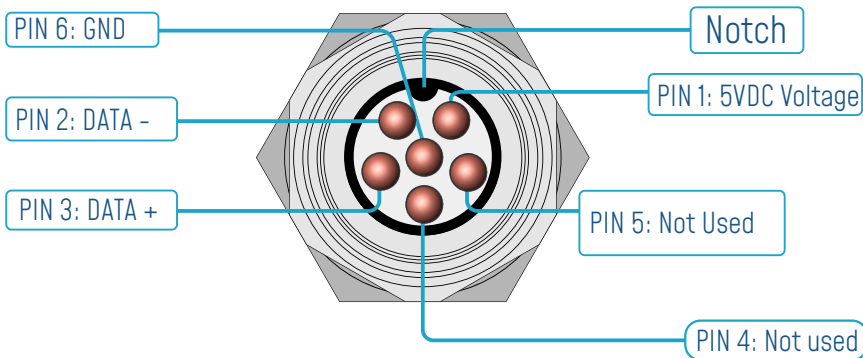## Optional Accessories and Services

|	
Magnetic Mounting	Magnetic Mounting Kit Ref: SAT-MAG-MNT
90° Bracket Mounting	90° Bracket mounting (with integrated eyelet) with 4 x M5 screws + Locknut Ref: SAT-BRACK-MNT
Calibration certificate	Calibration certificate provided by Satevis A static calibration method is used on a granite surface plate DIN876 Ref: CERT-SATEVIS-INCLINOMETER

6 Mounting Options

Option
Magnetic Mounting Base

Screw Mounting Base

ON/OFF Button-Shield

Option
90° Bracket + with Bullseye
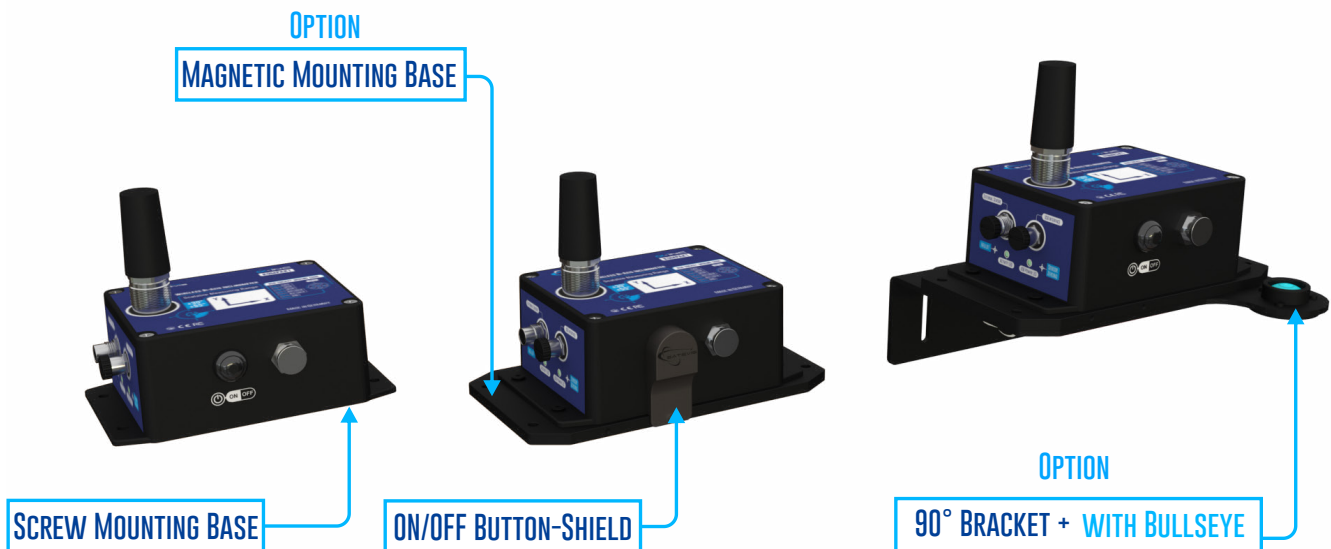
7 POWER SUPPLY

M8 6pin Socket (MALE, A-CODING)- Pin assignation

PIN 6: GND
PIN 2: DATA -
PIN 3: DATA +
Notch
PIN 1: 5VDC Voltage
PIN 5: Not Used
PIN 4: Not used

Interface Name	M8 Pin assignation
5VDC Voltage	PIN 1
DATA -	PIN 2
DATA +	PIN 3
Not used	PIN 4
Not Used	PIN 5
GND	PIN 6

M8 6pin Plug (FEMALE, A-CODING)- Pin assignation

PIN 6:GND
PIN 1:5VDC Voltage
PIN 5:Not Used
PIN 2:USB-DATA -
PIN 3:USB-DATA +
PIN 4:Not used
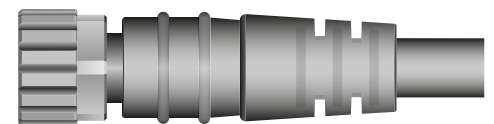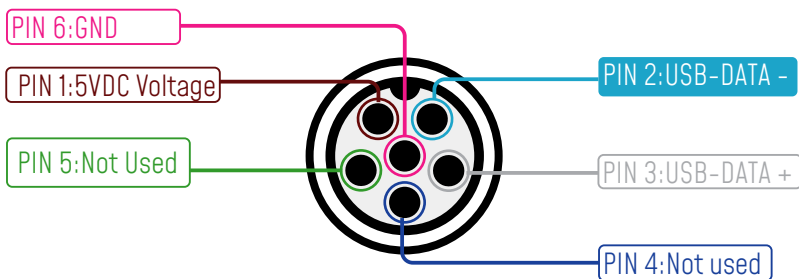
M8-6Pins Plug

Interface Name	5VDC Voltage	USB DATA -	USB DATA +	Not used	Not Used	GND
M8 Pin assignation	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6
Wire Color (A-coding)	BROWN	WHITE	GREY	BLUE	GREEN	PINK

8 Different Antenna Versions

High Gain Antenna 5dBI

Small Form Factor Antenna 2dBI

9 Overview

LoRaWAN Antenna

M8 Connector for External Sensor (Optional)

USB Interface for Device Config. and Power Supply

Vent

Hello! transmits Data on user request

Non-contact button for sensor zeroing

Activity LED

USB Power LED

ON/OFF Button
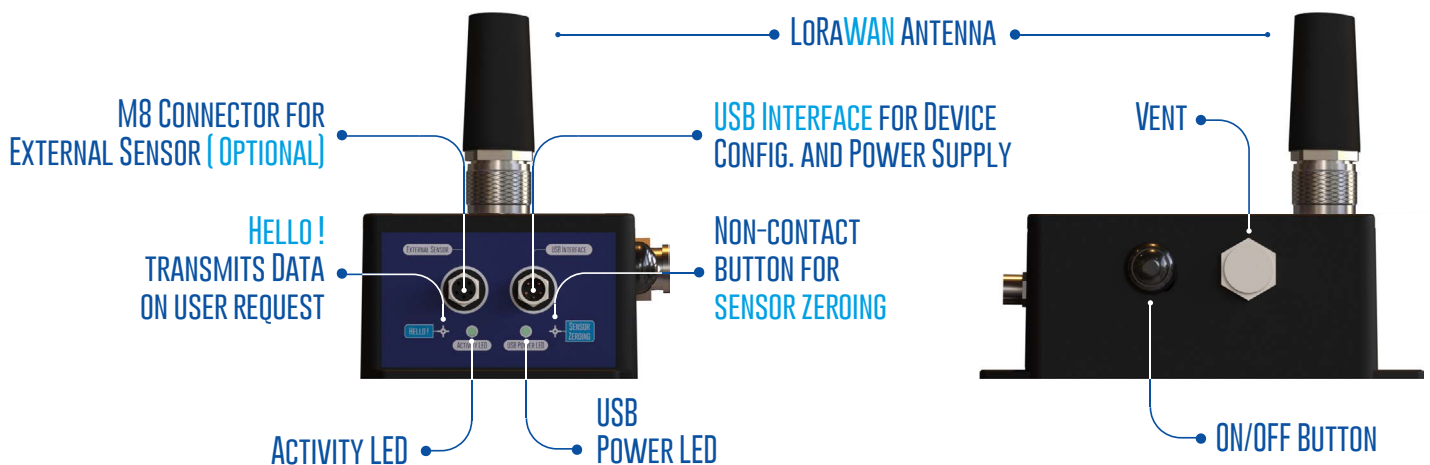
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