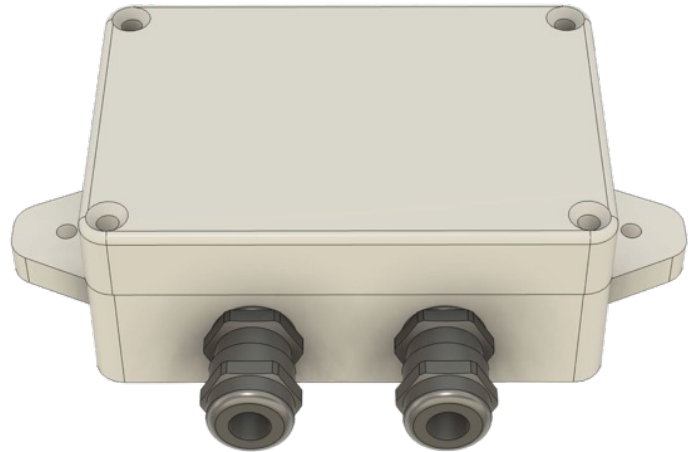# FØLSGAARD®

by iotbee

The Future of Customisable IoT Devices

Overview

Embrace the flexibility and power of Følsgaard by IoTBee, tailored for those who demand adaptability in their IoT deployments. Whether monitoring storm surge tanks, basements, or indoor air quality, IoTBee provides you with the customization and control you need.

Features

- Multiple Sensor Integration - Support for up to 6 different sensors, allowing diverse applications from a single device.
- Real-time Data Transmission - Data automatically transmitted via MQTT for timely insights.
- Platform Flexibility - Integrate with our trusted platform or choose your own. Expe-rience hassle-free data integration.
- Swift Installation: User-friendly design en-sures quick setup.
- Durability - Housed in an IP67-rated enclo-sure, the device is both dustproof and water-proof, ready for challenging environments.
- Battery Longevity - Benefit from up to 10 years of battery life, although lifespan may vary based on usage. *
- External power - It is possible to power the device with an external powersource when one is present (5-24V).
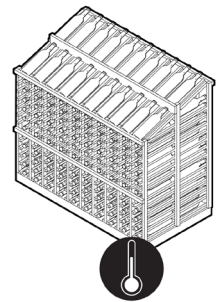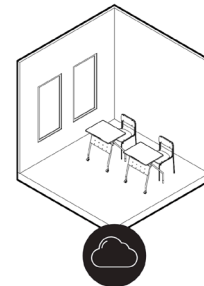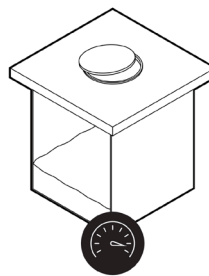- Enclosure Rating - IP67.

Applications

The IoT device is perfect for:

Storm Surge Tanks
Depth measurement

Indoor Air Quality
CO_2 seonsor

Basements
Temperature

Storm Surge Tanks - Reliable and efficient level monitoring.
Basements - Keep an eye on temperature, moisture levels, and more.
Power Monitoring - Ensure your assets are always powered ON.

*(Lifespan tests will be conducted together with Force Technology during the fall of 2023)

Technical Specifications

- **Sensor Capacity** -Integrate up to 6 unique sensors. Communication Protocol for data transmission over network: MQTT.
- **Connectivity options** - Use NB-IoT (includ-ed 10MB/month of data over a simcard), WiFi or Bluetooth for transmitting data.
- **Temperature** - from -35 to 75 degree Cel-sius. Extreme temperatures will effect the lifespan.
- **Processors**: 32-bit core RISC-V microcon-troller with a maximum clock speed of 160 MHz.
- **Battery Life** - Up to 10 years, subject to us-age.
- **CE certification**: Due to addition of features, Q3 2023.
- **OTA:** Software updates over the air available from Q4 2023.
- **Processors**: 32-bit core RISC-V microcon-troller with a maximum clock speed of 160 MHz.
- **Storage**: 400 KB of internal RAM, and 4MB of external flashmemory

Pin Configuration

The device is equipped with a variety of in-put and output options to cater to a broad spectrum of projects. Here's a summary of its capabilities:

- **Sensor Inputs:** The IoT device has 7 sensor input ports. These are numbered from 0 to 6, providing many options for connecting different sensors.
- **Voltage Outputs:** There are 3 outputs that provide a voltage of 3.3V.
- **24V Input/Output:** The device features two ports that can function both as inputs and outputs, supporting a voltage level of up to 24V.
- **Ground (GND) Inputs:** For establishing common electrical ground, the device offers 3 GND input ports.
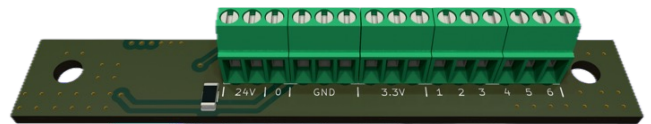
0	1	2	3	4	5	6
4-20ma	GPIO ADC	GPIO ADC	GPIO ADC	GPIO ADC	GPIO SDA	GPIO SCL

Sensor Integration Capabilities of the Folsgaard IoT device

IoTBee is equipped with multiple interface ports to accommodate a variety of sensors. The num-ber in brackets indicates the quantity of each interface available on the IoT device.

I2C: up to 6 interfaces
Analog: up to 3 interfaces
Digital: up to 6 interfaces
RS485: up to 1 interface
UART: up to 1 interface
4-20mA: up to 1 interface

| connectivity	Digital	2-wire + Digital	3-wire + Digital
Analog interface	–	$4-20mA$	$0-3.3V$
Digital interface	RS485, I^{2}C, UART	RS485, I^{2}C, UART	RS485, I^{2}C, UART
Voltage supply	$3.3-24V$	$3.3-24V$	$3.3-24V$

Power Considerations for Sensors

The IoT device can support sensors with voltage requirements ranging from 3.3V to 24V. If the device is powered externally, it provides the same voltage level it receives to the sensors. For instance, if the device is powered with a 12V supply, it will output 12V to the sensors.

A constant 3.3V is always available on the board, allowing for a mix of 3.3V sensors with higher voltage sensors (12V or 24V). However, note that when the IoT device is battery-powered at 3.3V, elevat-ing this to 24V for sensor requirements would lead to significant energy inefficiencies. Therefore it's essential to use an external power source if your sensor requires anything above 3.3V to function efficiently.

Setup guide

Setup & Configuration
With a focus on user experience, the IoT device boasts a simple installation process. Whether you're integrating sensors or setting up data transmission, the device ensures a hassle-free setup. We install your chosen sensors on each device, you therefore just have to focus on finding the right location. To activate the IoT device, simply remove the battery protection. The IoT device will automatically connect to the NB-IoT network and start transmitting data. Access the device on www.hive.lotbee.net to ensure it has connected after initial setup.
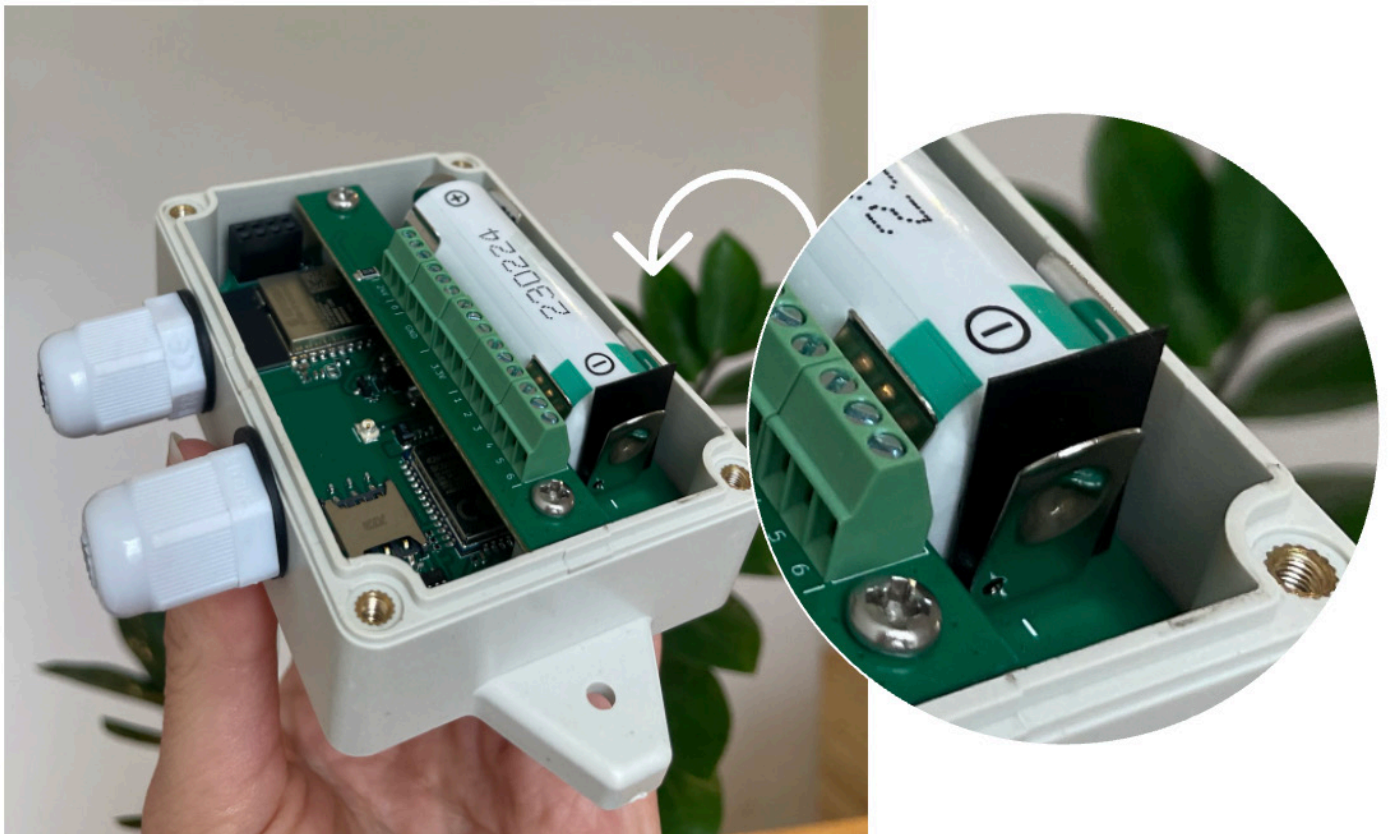
Remove small black piece of plastic to start the IoT device.

Ordering & Support
For ordering information, pricing details, and technical support, visit our website or contact our sales and support teams.
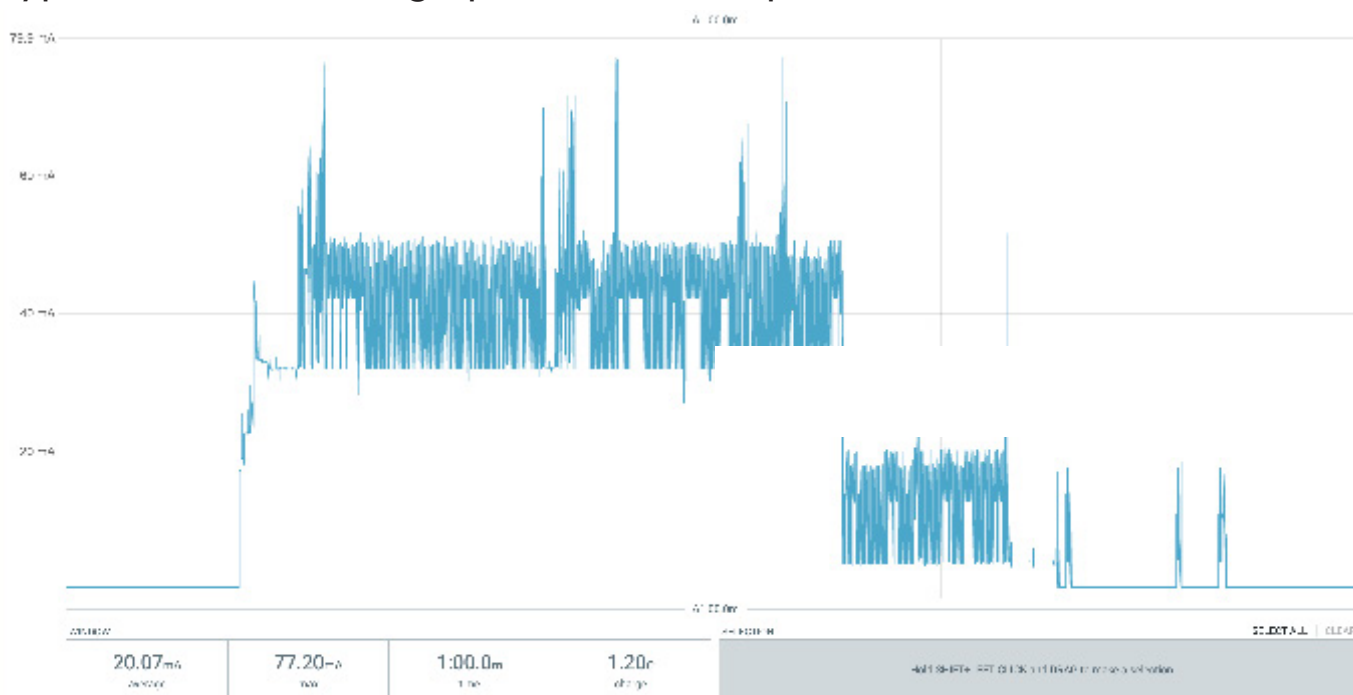
Power Consumption

Battery
The IoT device incorporates the Saft LS 17500 battery, a 3.6V Li-SOCl2 cell holding 3600mAh. This battery is engineered for applications span-ning 5 to 20 years or more. With a temperature tolerance, ranging from -60°C to +85°C, and offers impressive corrosion resistance.
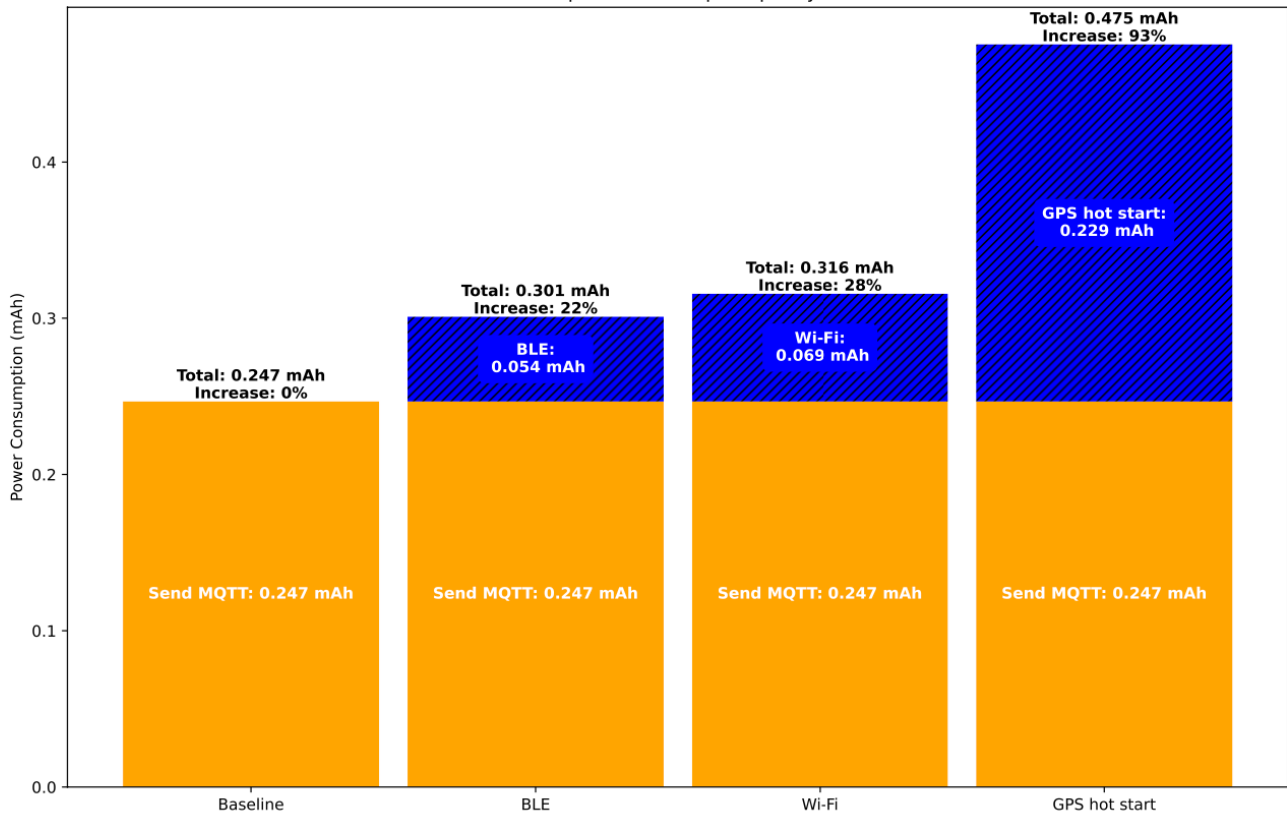

Typical MQTT message power consumption

With an low average power consumption between 0.200mAh and 0.333mAh when sending a message, you can confidently send anywhere from 5,000 to 10,000 messages on a single battery charge.

Mean power consumption per cycle

	Send MQTT		BLE		WI-FI		GPS hot start	
Cycle	Time (s)	Power (mAh)	Time (s)	Power (mAh)	Time (s)	Power (mAh)	Time (s)	Power (mAh)
1	34.8	0.247	5.4	0.055	7.2	0.067	13.7	0.211
2	35.4	0.253	5.4	0.054	7.1	0.068	14.4	0.239
3	36.9	0.247	5.4	0.054	7.3	0.070	11.0	0.183
4	34.6	0.244	5.4	0.054	7.6	0.071	17.4	0.267
5	34.7	0.242	5.4	0.054	7.3	0.071	13.6	0.214
6	34.7	0.242	5.4	0.054	7.3	0.070	13.3	0.214
7	34.6	0.242	5.4	0.053	7.2	0.067	15.6	0.253
8	35.0	0.247	5.3	0.054	7.2	0.069	12.7	0.200
9	36.5	0.261	5.3	0.054	7.2	0.069	13.7	0.219
10	34.8	0.242	5.4	0.054	7.1	0.068	17.0	0.286
Mean	35.2	0.247	5.4	0.054	7.3	0.069	14.2	0.229
Total	351.9	2.467	53.8	0.541	72.5	0.690	142.4	2.286
%Increase	0%	0%	15%	22%	21%	28%	40%	93%

GEO location techniques and performance

inlcuding NB-IoT serving tower, WIFI sniffing, BLE beacon and GPS
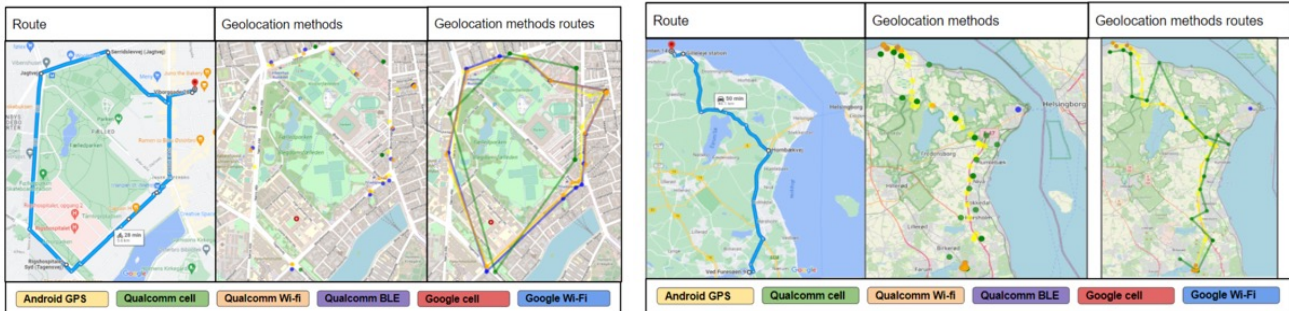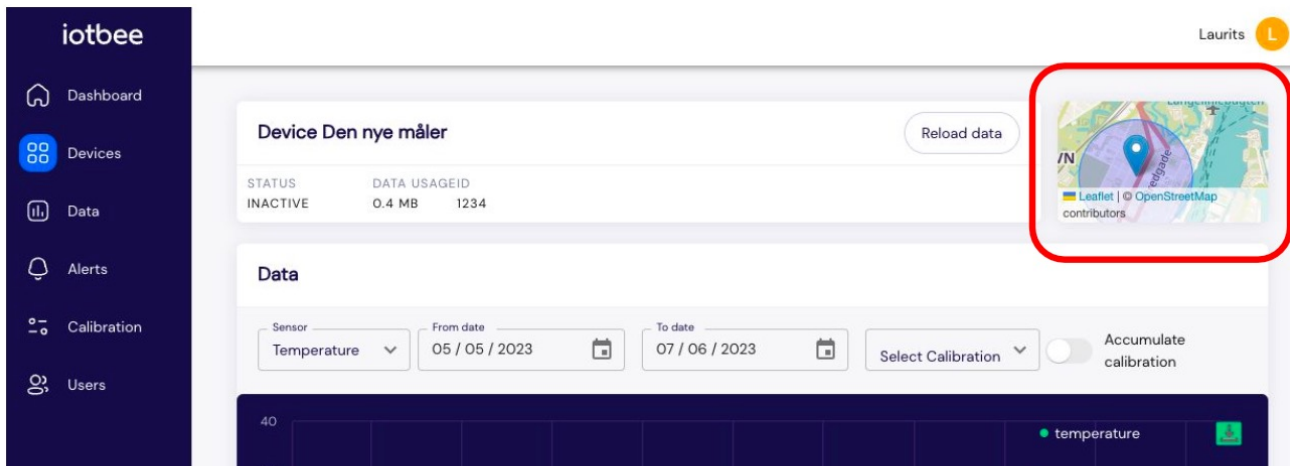
Geolocation Techniques	Power Consumption	Availability	Accuracy	Small Data Packages	Low Cost
Nb-IoT serving tower	Low No power consumption, as data is available from NB-IoT service provider API	High Avaliable where NB-IoT has coverage (all of denmark) Outdoor and inddoor	Low Urban: ~0 to 500 meter (Depends on distance to tower)	Low No increase in data package size	Low No additonal cost location is available from NB-IoT service provider API
Wi-Fi Fingerprinting	Medium From performance testing: 22% increase	Medium Urban: High suburban: medium Rural: low	High Urban: ~10m	Medium Device must send information on available Wi-Fi's	Medium google geolocation API (cost per API call)
BLE Beacon Fingerprinting	Medium From performance testing: 28% increase	Medium Urban: High suburban: medium Rural: low	-	Medium Device must send information on available BLE beacons	Medium Qualcomm geolocation API (cost per API call)
GNSS Geolocation	High From performance testing per cycle: Hot start: 93% increase Warm start: Significantly more	High GNSS services are available globally Outdoor only	High Urban: ~10m	Low Device must send only the geolocation	Medium High Quality, low power module (cost per GNSS module)