



FFT testing

S3

Smart Sensor System for acquisition, wireless transmission, and storage of measurement data

one step ahead in **INTELLIGENT** production systems



FFT testing S3

Smart Sensor System for acquisition, wireless transmission, and storage of measurement data

1

Properties

Structure, sensors, and interfaces

2

Modularity

Extensibility and customizability

3

Application

Examples

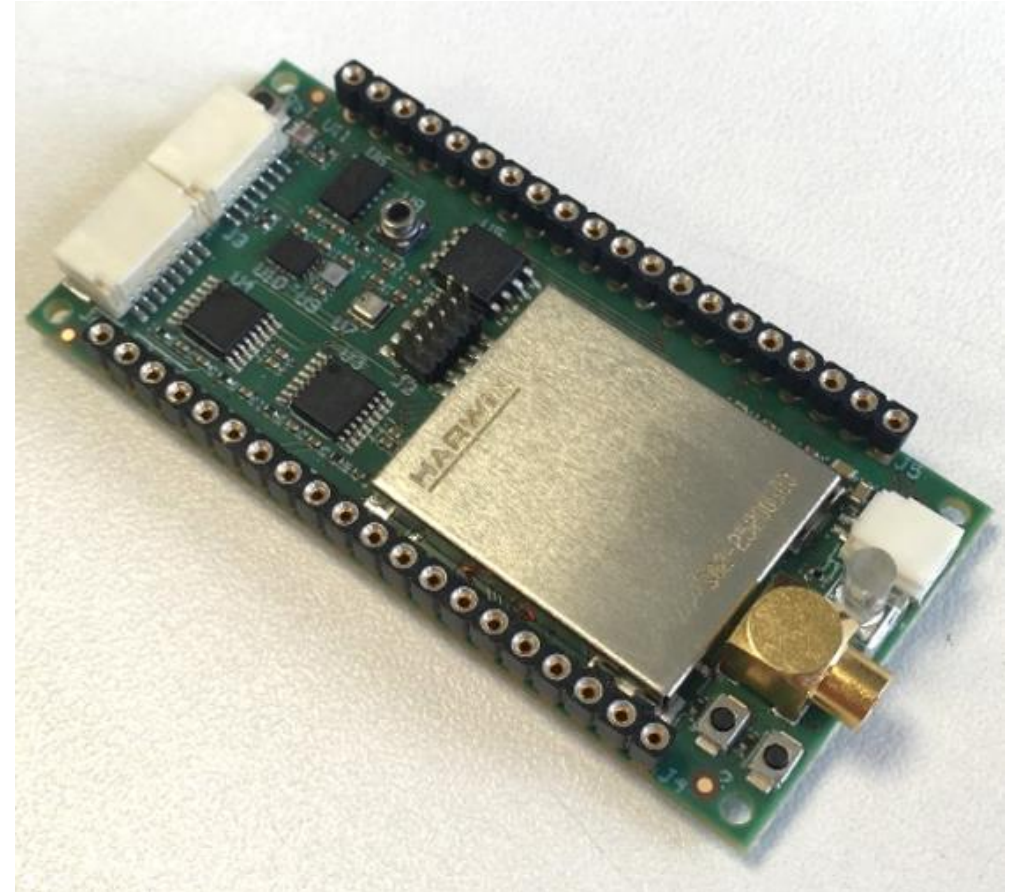
FFT*testing* S3

Smart **S**ensor **S**ystem for acquisition, wireless transmission, and storage of measurement data

- **FFT*testing* S3** is a flexible, modular, and scalable measurement system that can easily be used in a wide variety of measurement applications and environments thanks to wireless data transmission, battery operation, and a compact size
- The **FFT*testing* S3** sensor network consists of one or more sensor boards for data acquisition and local storage as well as an optional gateway as an interface for decentralized storage and visualization of the measurement data

Properties:

- Scalable through modular network topology
- Expandable with external sensors and BUS interfaces
- Energy-efficient due to smart operating modes
- Compact and adaptable design
- Various radio standards: BLE, WiFi, Sub-GHz
- Data synchronization and transmission in the millisecond range



1

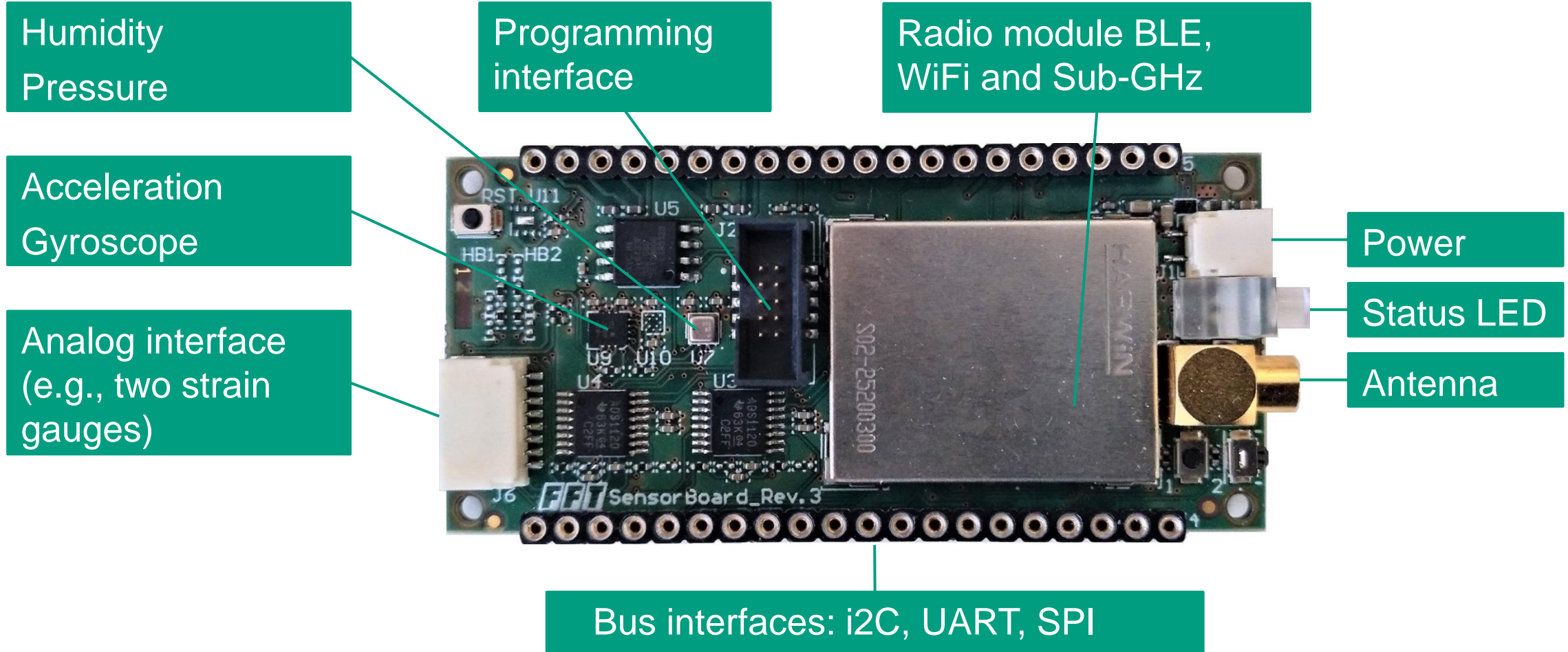
Properties

Structure, sensors, and interfaces

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Properties

Structure



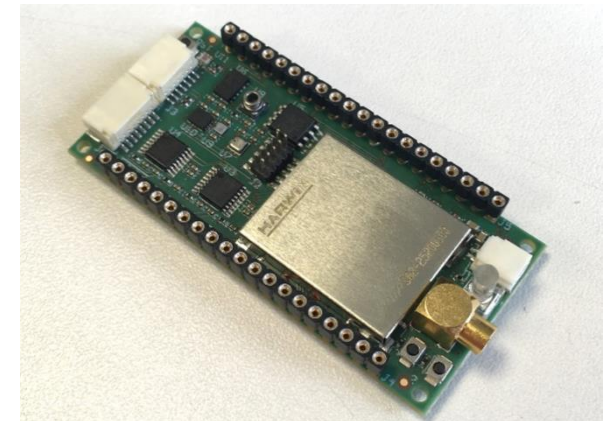
Properties

Sensors and interfaces

| Sensor | Measured variable | Range | Accuracy (min) | Sampling rate |
|---------------|-------------------|------------------------------------|---------------------|---------------|
| Bosch BMI 280 | Pressure | 300 – 1100 hPa | 1,7 hPa | 182 Hz |
| Bosch BMI 280 | Humidity | 0 – 100 % RH | ±3 % RH | 1 Hz |
| Bosch BMI 280 | Temperature | -40 – +65 °C | ±1,5 °C | 1 Hz |
| Bosch BMI 160 | Gyroscope | 125 – 2000 °/s | 16 bit (resolution) | bis 3,2 kHz |
| Bosch BMI 160 | Acceleration | ±2 – ±16 g (Range configurable) | 16 bit (resolution) | bis 1,6 kHz |

| Size | mm |
|--------|----|
| Length | 65 |
| Width | 30 |
| Height | 8 |

| Radio standard | Frequency | Data transfer rate |
|----------------------|-----------------|--------------------|
| Bluetooth Low Energy | 2402 – 2450 MHz | 125 kbps – 1 Mbps |
| Sub-GHz | 861 – 1054 MHz | 2,5 kbps – 1 Mbps |
| WiFi | TBD | TBD |



2

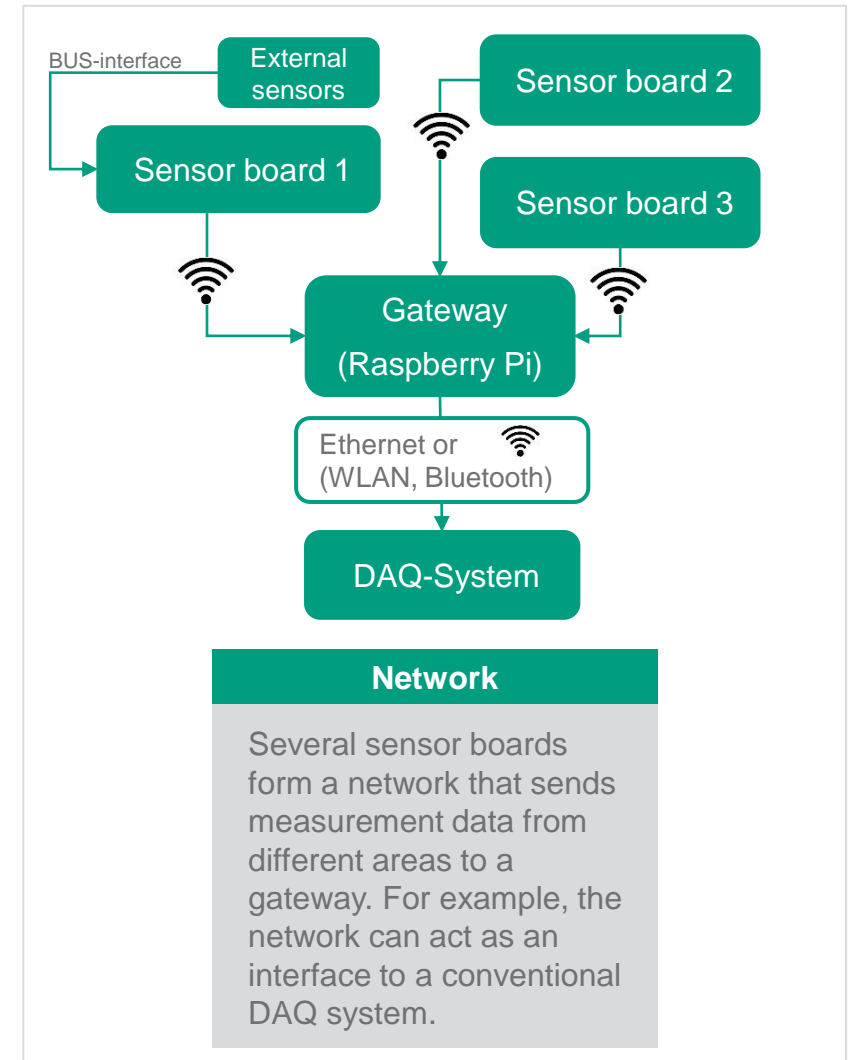
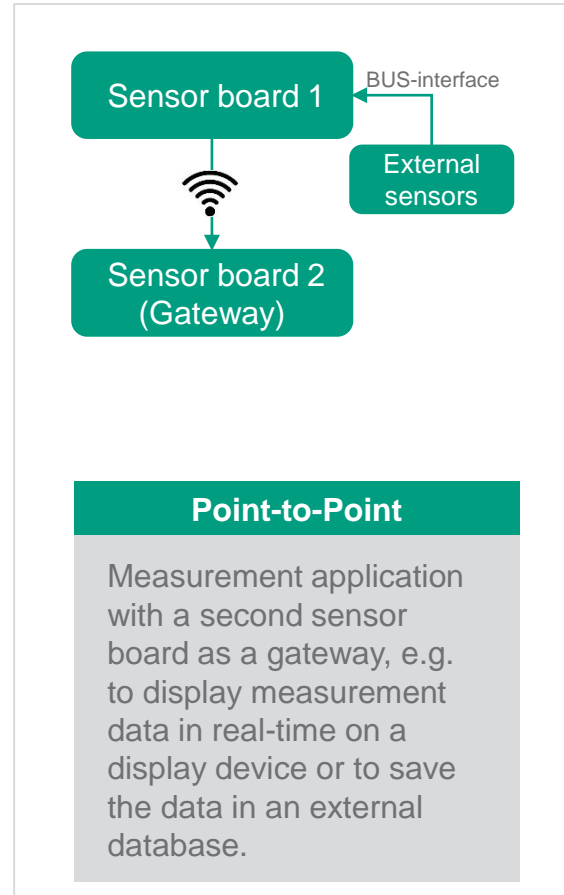
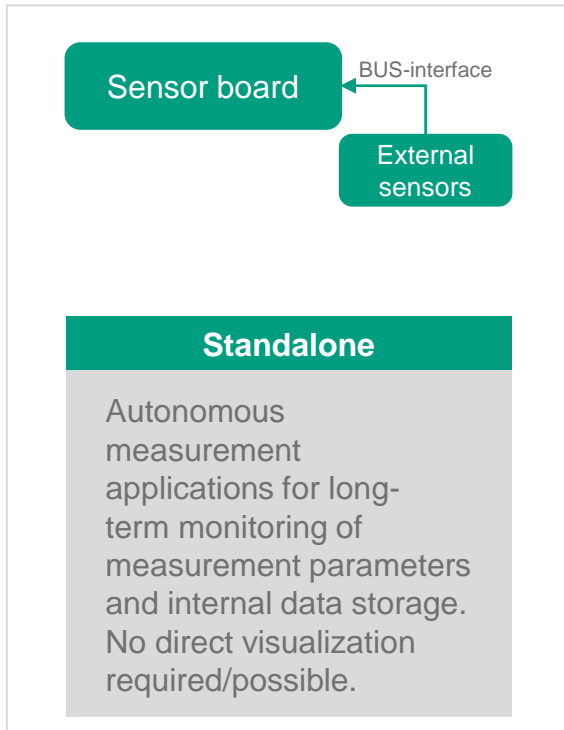
Modularity

Extensibility and customizability

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Modularity

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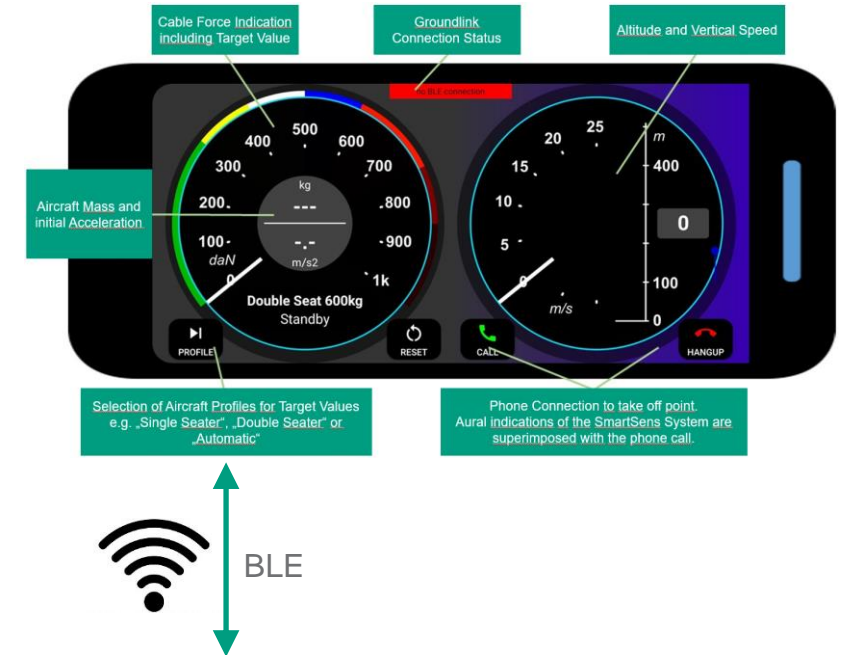
Application

Cable force measurement at glider winch launch

- Cable force measurement during glider winch launch using strain gauges
- Use of two customized sensor boards (Flying Link & Ground Link)
- Communication between Flying Link and Ground Link in the sub-GHz frequency range with a range of up to 2.5 km
- BLE connection between Ground Link and smartphone app Integrated display to show the measurement data and the system status in real-time
- Field use since 2020 at various airfields
- Very long battery life (>1.5 years)



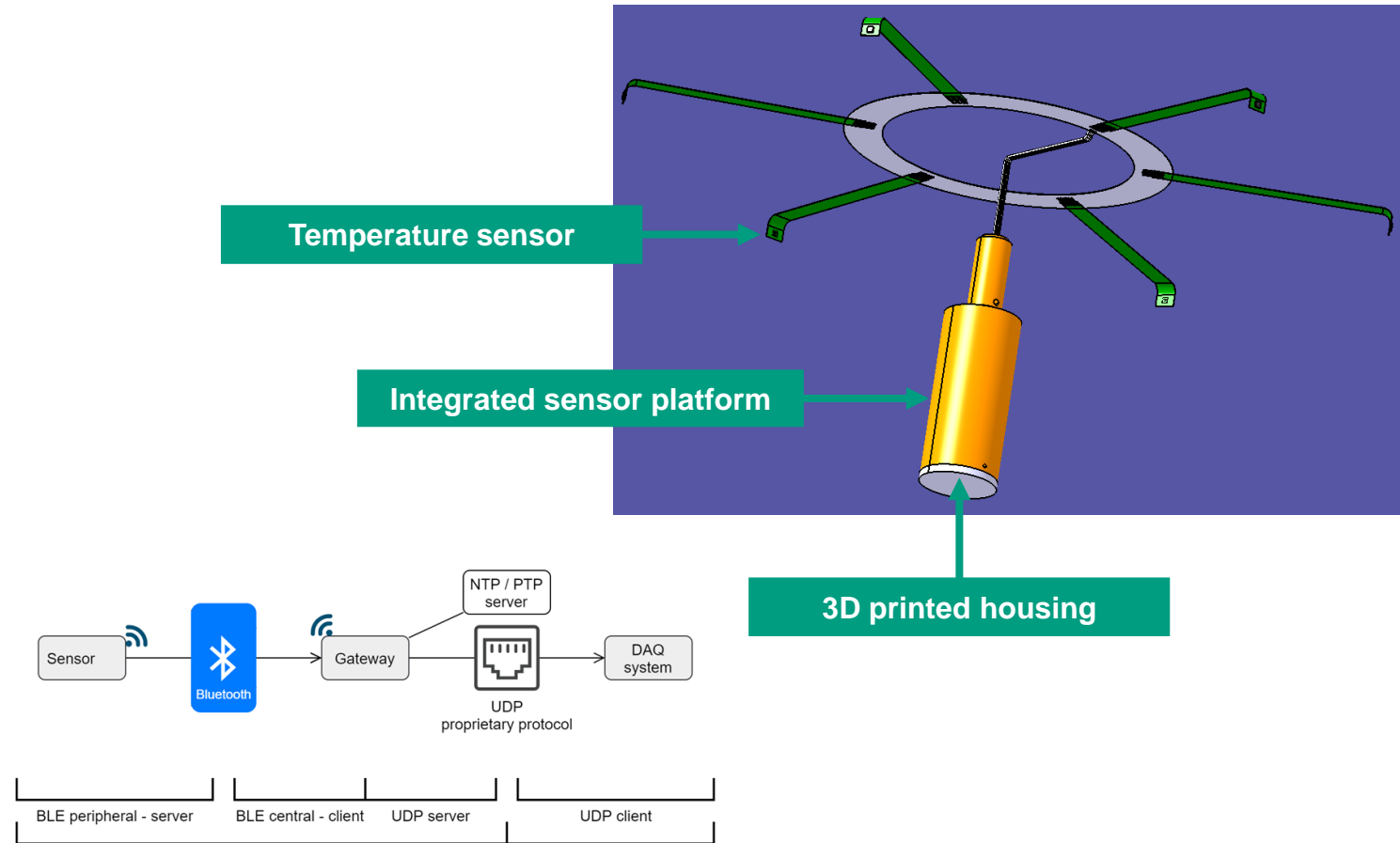
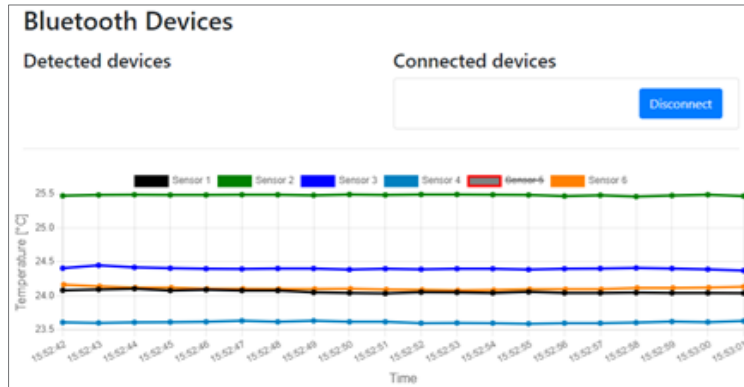
| Parameters |
|----------------------|
| • cable force |
| • altitude |
| • reception strength |
| • battery status |
| • Sensor ID |
| • error messages |



Application

Multiple temperature measurements on the rotor of an electric motor

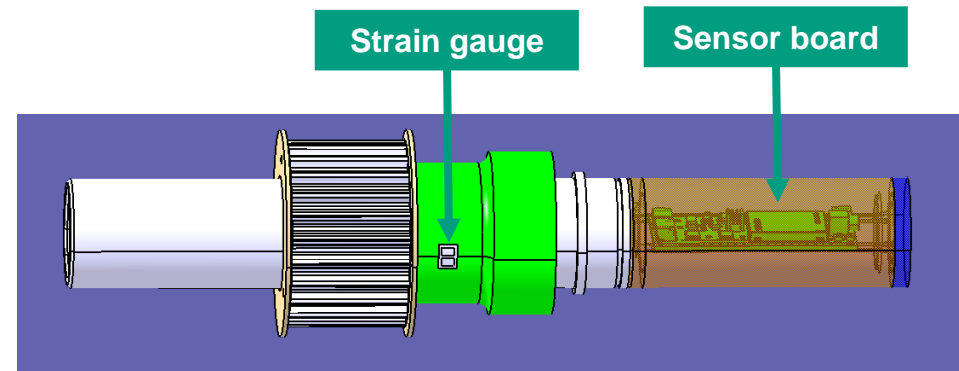
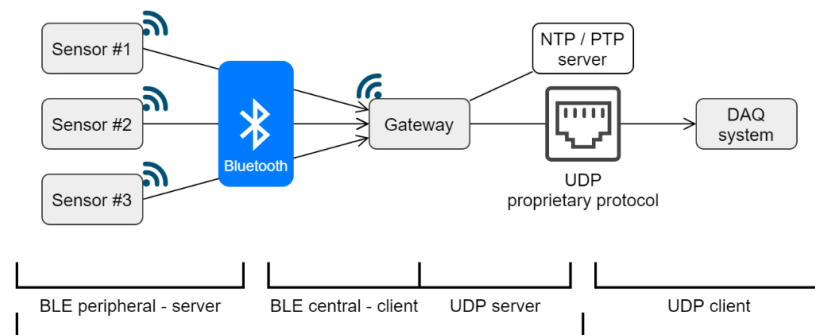
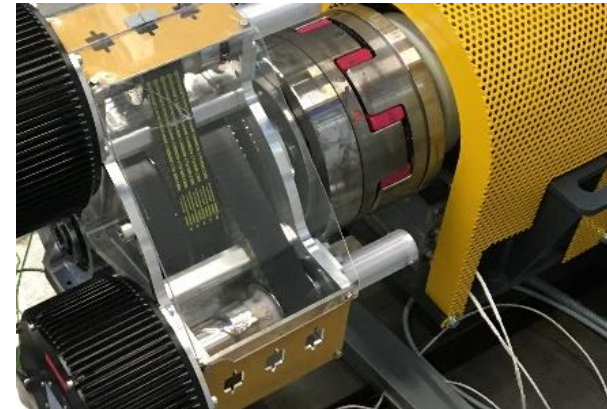
- Six temperature sensors via I2C interface
- Wireless data transmission via BLE
- Data display in real-time
- Using flexible PCBs for sensor integration
- Fully rotating measuring point



Application

Torque measurement on high-speed rotating shafts of a planetary gear

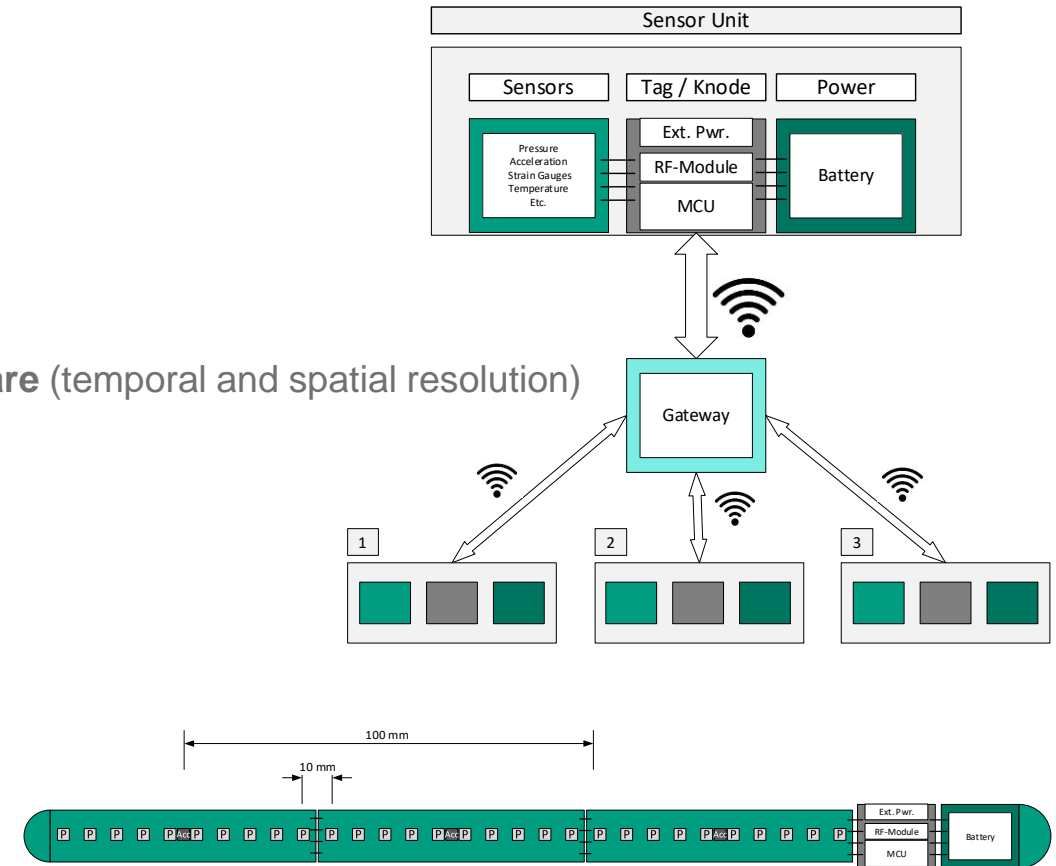
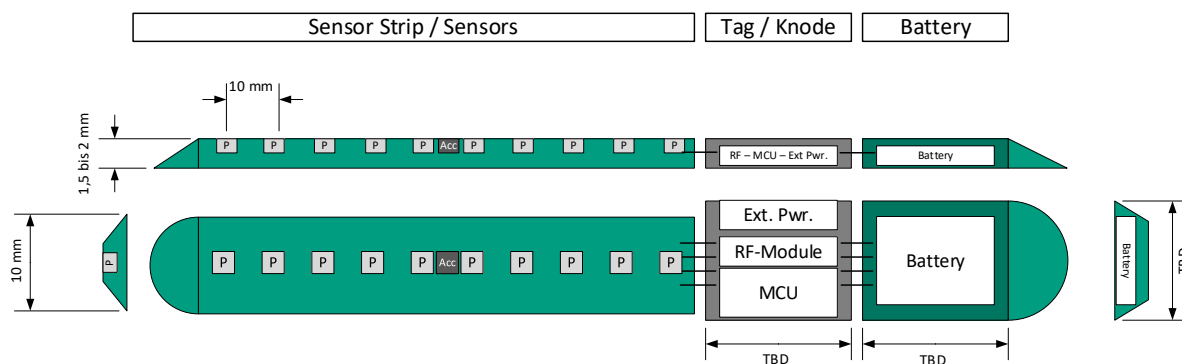
- Simultaneous torque measurement on three separate shafts of a planetary gear, each with one sensor board
- Torque measurement using strain gauges
- Synchronization of the sensor data in the millisecond range
- Wireless data transfer via BLE
- Storage and visualization of the data via a gateway and existing DAQ system




Application

Flexible sensor strip for measuring pressure and acceleration

- **Flexible, thin sensor strips:**
 - 10 pressure sensors
 - 1 acceleration sensor
 - Humidity/Temperature optional
 - Distance 10mm
- **Modular and pluggable combination of sensor strips**
- **Number of sensors and sampling rates can be adapted via software** (temporal and spatial resolution)
- **Sensor strips on flexible PCB**





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THANK YOU

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