Sensors Module Documentation

1. Introduction

The sensors module is a crucial part of the mobile station, responsible for measuring environmental conditions and biodiversity parameters. This document outlines the types of sensors used, their selection criteria, integration challenges, and expected outcomes.

2. Objectives

The primary objectives of the sensors module are:

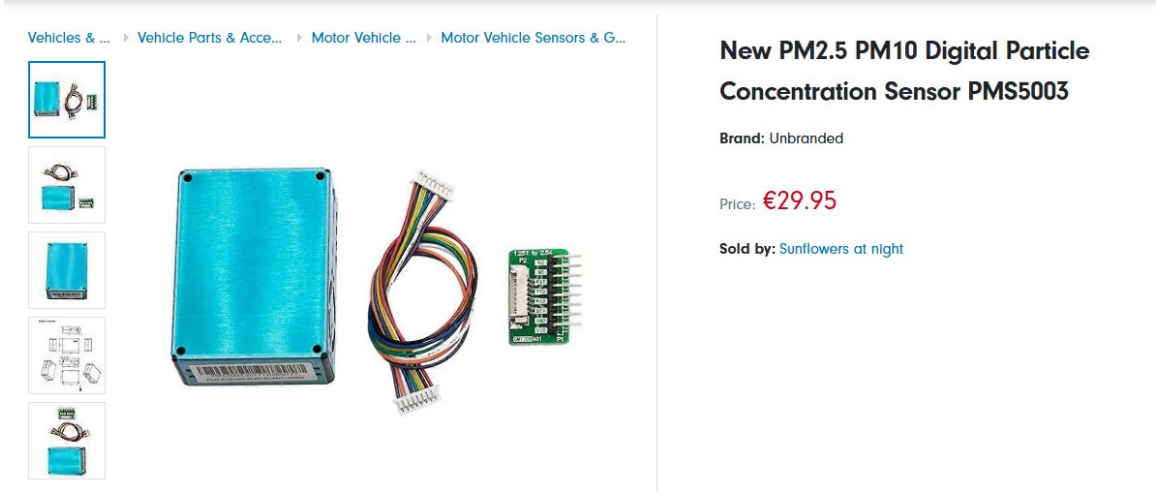
- **Accurately measure environmental parameters** such as air quality, soil composition, water quality, temperature, and sound levels.
- **Enable continuous data collection** to monitor changes in real-time.
- **Integrate multiple sensors** efficiently for optimal data aggregation.
- **Ensure compatibility** with the station's power system and data transmission network.
- **Maintain robustness and reliability** under various environmental conditions.
- **Prioritize low-power consumption** to maximize battery life and operational efficiency.

3. Sensor Types and Functions

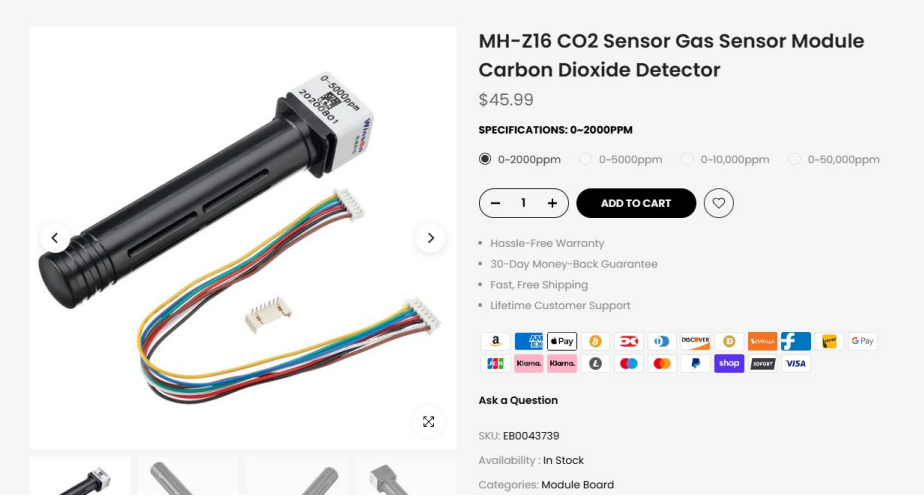
The following sensors will be integrated into the station:

3.1 Air Quality Sensors

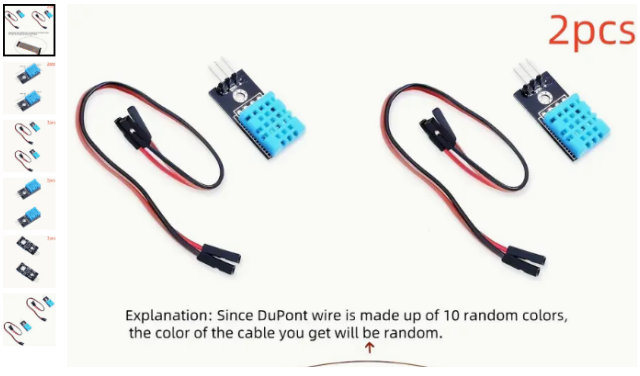
- **Fine Particulate Matter Sensor (PM2.5, PM10)**
  - Example: **PMs5003**
  - Price: **30 €**
  - Placement: Fixed at a height of **1.5 to 2 meters** to measure breathable air for animals. Protect the sensor with a waterproof case that has air openings.



- **Carbon Dioxide (CO_2) Sensor**
  - Example: **MH-Z16**
  - Price: **40€**
  - Placement: Positioned near the particulate matter sensor for cross-analysis. Ensure good airflow around the sensor.



- **Temperature and Humidity Sensor**
  - Example: **DHT11**
  - Price: **3 €**
  - Placement: Place the sensor in the shade to avoid inaccurate readings due to direct sunlight. Use a ventilated casing for protection.



2PCS DHT11 Capteur de température et d'humidité pour Arduino, Capteur de câblage électrique double usage en fibre de verre, Tension de fonctionnement ≤36V, sans batterie ni laser

586 ventes | Vendu par le professionnel >

5,0 ★★★★★

#7 Meilleure vente de ce vendeur

2,34€

✓ Livraison gratuite Incroyable !

Couleur: Noir

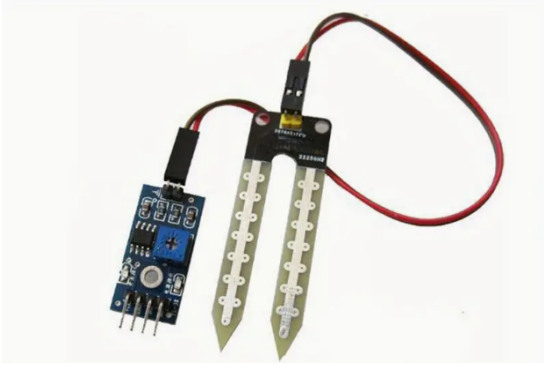
Qté 1

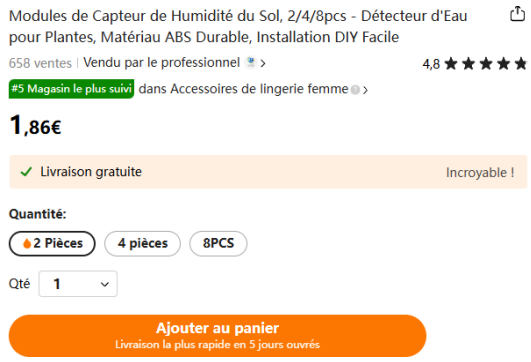
Ajouter au panier

Livraison la plus rapide en 5 jours ouvrés

3.2 Soil Quality Sensors

- **Soil Moisture Sensor**
  - Example: **HA141507**
  - Price: **~2 €**
  - Placement: Insert into the soil at **10-15 cm depth** for herbs or **30 cm for trees**. Ensure stable installation.





- **Soil pH Sensor and Soil Electrical Conductivity Sensor**
  - Example: **Kit de test de sol 6 en 1**
  - Price: **~16 €**
  - Placement: Perform spot measurements in strategic areas. Clean the electrode after each use to maintain accuracy.

3.3 Sound Quality Sensors

- **Sound Level Sensor**
  - Example: **DIY victor**
  - Price: **~2 €**
  - Placement: Place in areas for noise level detection. Can be combined with microphones for detailed analysis.

3.4 Additional Modules for the Station

- **Distance Sensor**
  - Example: **HC-SR04P**
  - Price: **~1 €**
  - Placement: Mounted on the station base to avoid obstacles.

4. Selection Criteria

The following criteria will guide the selection of sensors:

- **Accuracy**: High measurement precision is necessary for reliable data analysis.
- **Power Consumption**: Sensors should operate efficiently with minimal energy draw.
- **Environmental Durability**: Must withstand temperature variations, humidity, and exposure to dust/water.
- **Connectivity**: Should be compatible with the station's data transmission protocols (Wi-Fi preferred).
- **Data Integration**: Sensors must provide standardized output formats (e.g., analog, digital, I2C, SPI, UART) for seamless integration.
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5. Challenges and Considerations

- **Interference and Noise**: Ensuring accurate readings despite environmental noise (e.g., electromagnetic interference, cross-sensor interaction).
- **Calibration and Maintenance**: Periodic calibration may be required to maintain measurement accuracy.
- **Data Storage and Processing**: Managing large datasets and filtering redundant information.
- **Weather Resistance**: Ensuring all sensors remain functional in extreme conditions (rain, heat, snow).
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6. Expected Outcomes

By implementing this sensor system, the mobile station will be able to:

- Provide real-time environmental monitoring.
- Support biodiversity research with automated data collection.
- Improve decision-making for ecological conservation efforts.
- Ensure seamless communication with the central data processing unit.
- Optimize energy efficiency through the use of low-power sensors.
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7. Conclusion

The sensors module is a vital component of the mobile station, ensuring continuous and accurate data collection. Proper selection, integration, and maintenance will ensure that the station meets its objectives in environmental and biodiversity monitoring while maintaining energy efficiency.