

Rain sensor

Solar power

Objectives

Wind speed sensor



Reflections

Arduino box

Index

Prototype V1



Low power

WeatherStation

Wind direction sensor

By Antonin, Bryan,
Chantal and Job

Temperature/ humidity sensor

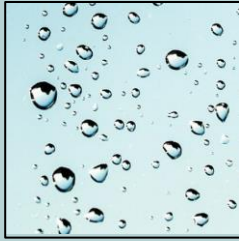


Questions

Prototype V2

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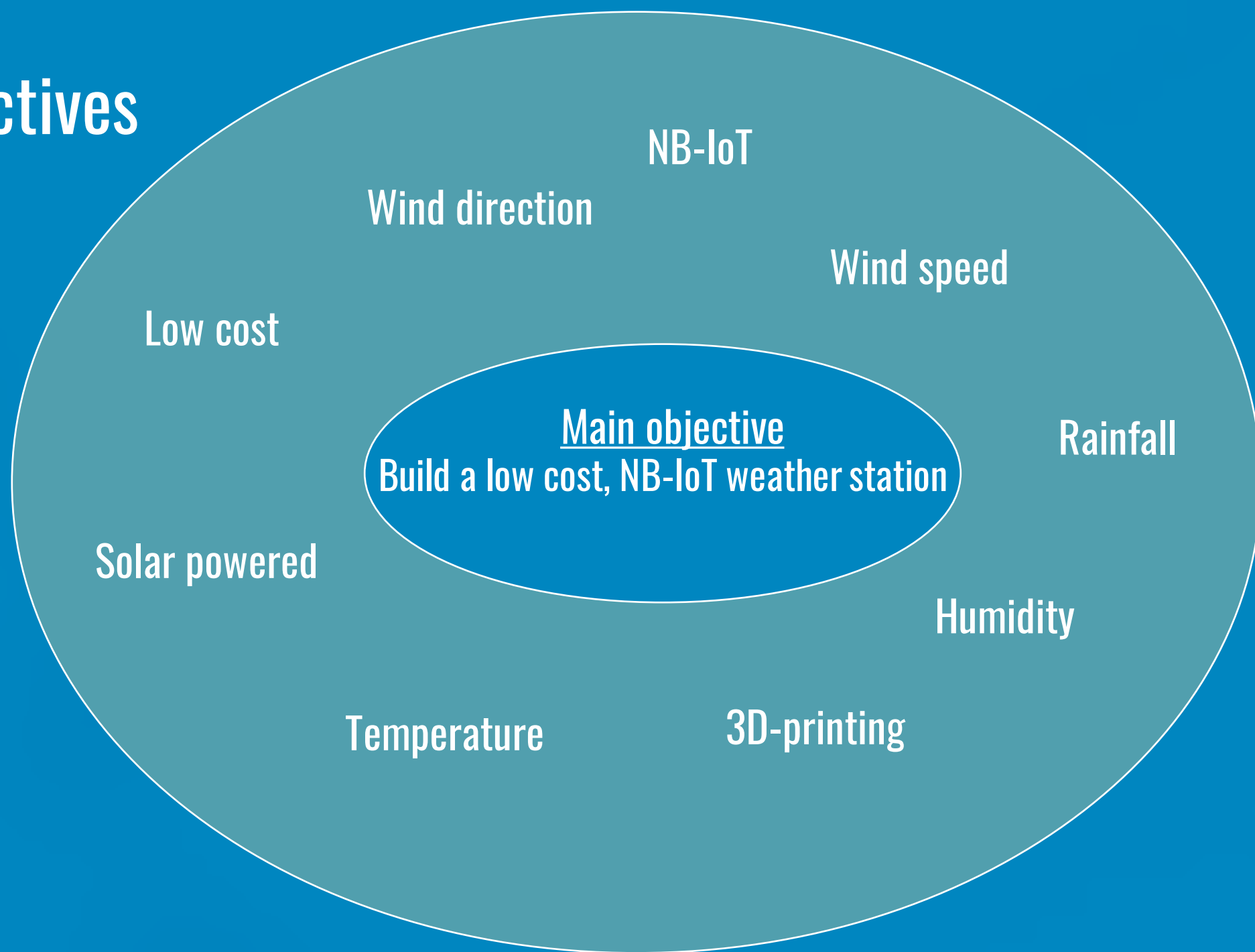
Temperature/ humidity sensor



Questions

Prototype V2

Objectives



Prototype V1

Design

- Temperature sensor
- Rain sensor
- Wind speed/direction sensor

Add-ons

- Solar powered
- Light sensor
- PCB
- Snow depth sensor

Code

- Make the code use less energy
- Add new code for the new sensors
- Switch from LTE-M to NB-IoT



Design

- Temperature sensor
- Rain sensor
- Wind speed/direction sensor



Prototype V1

Design

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Add-ons

- Solar powered
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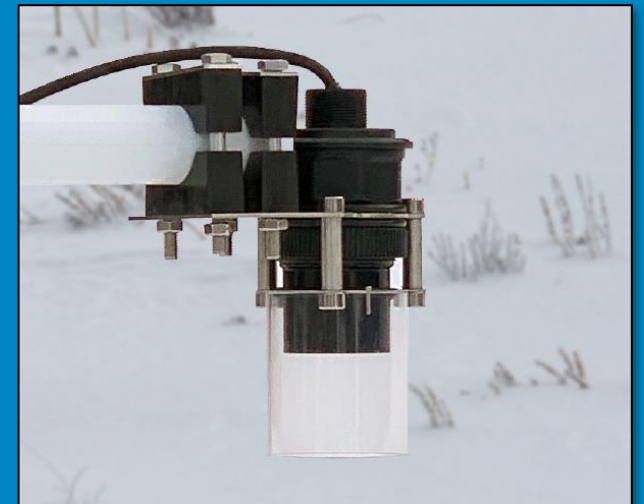
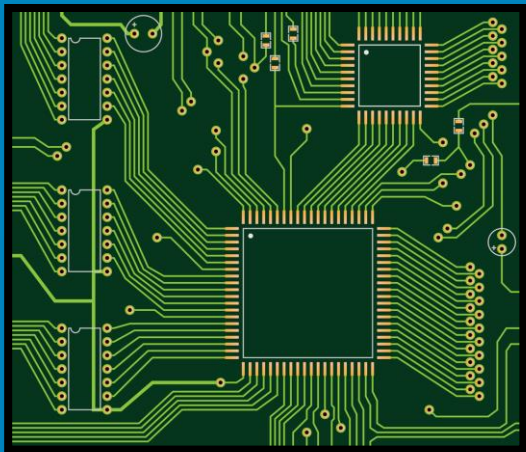
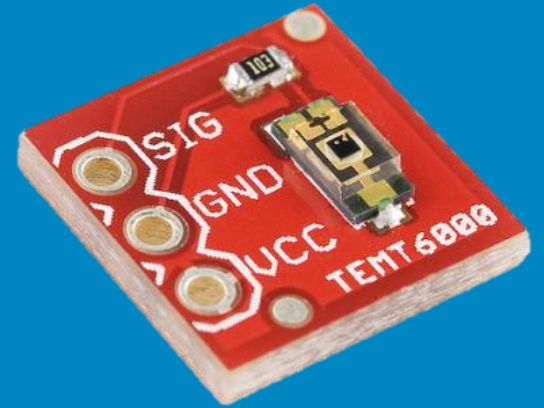
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Add-ons

- Solar powered
- Light sensor
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- Snow depth sensor



Prototype V1

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- Wind speed/direction sensor

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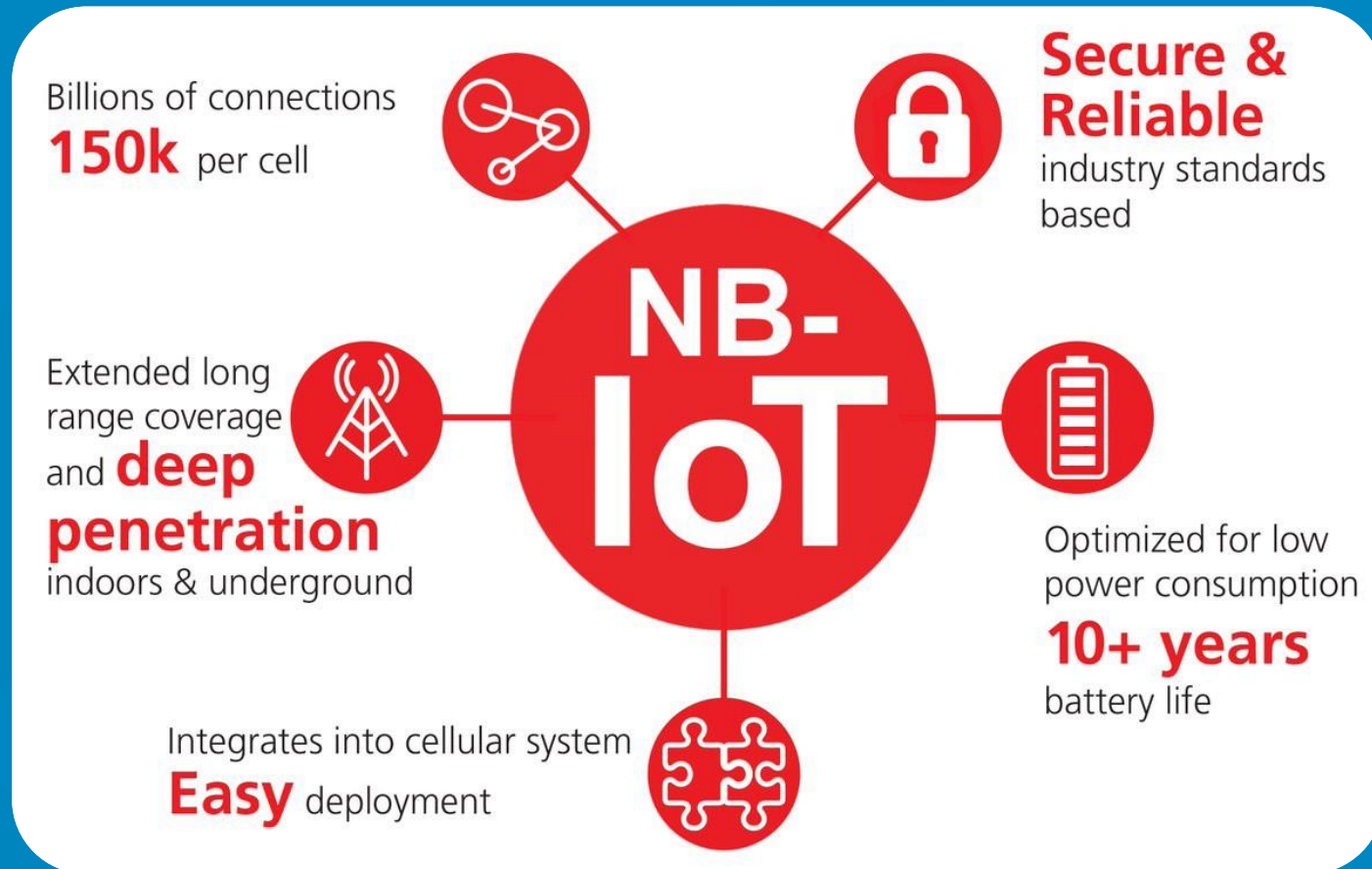
Code

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Code

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Prototype V1

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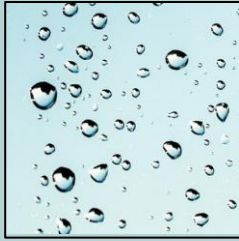
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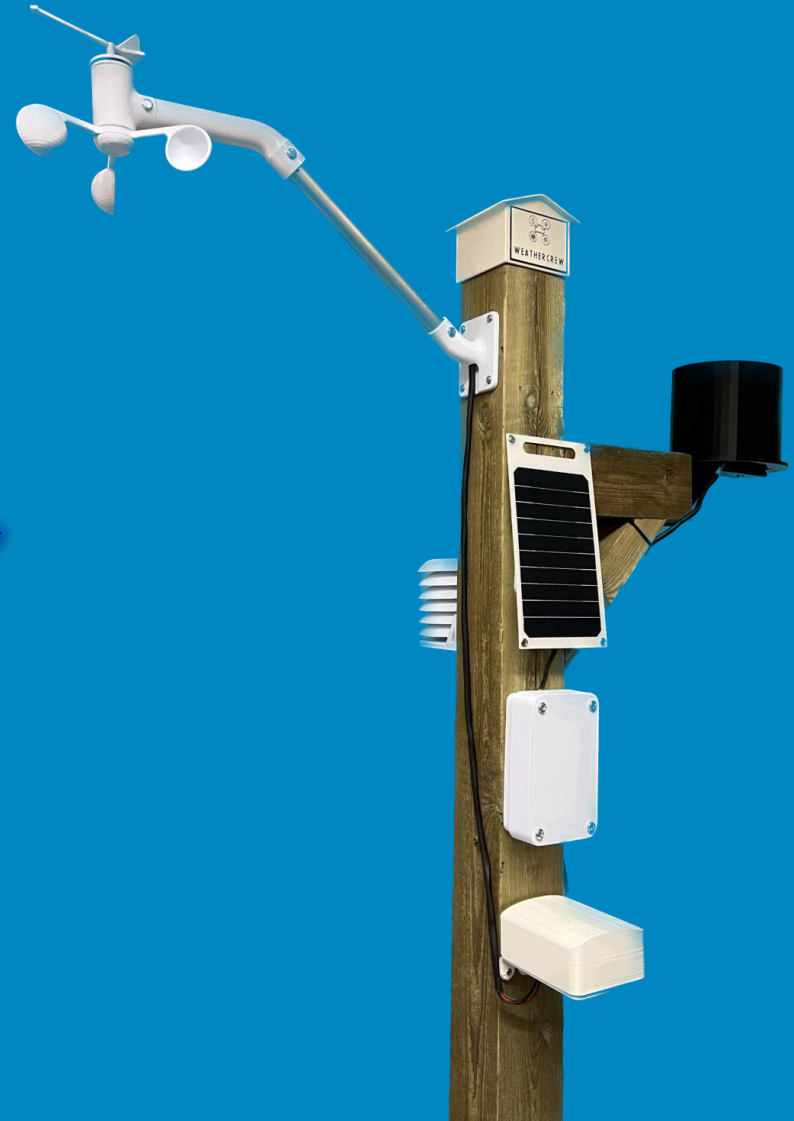
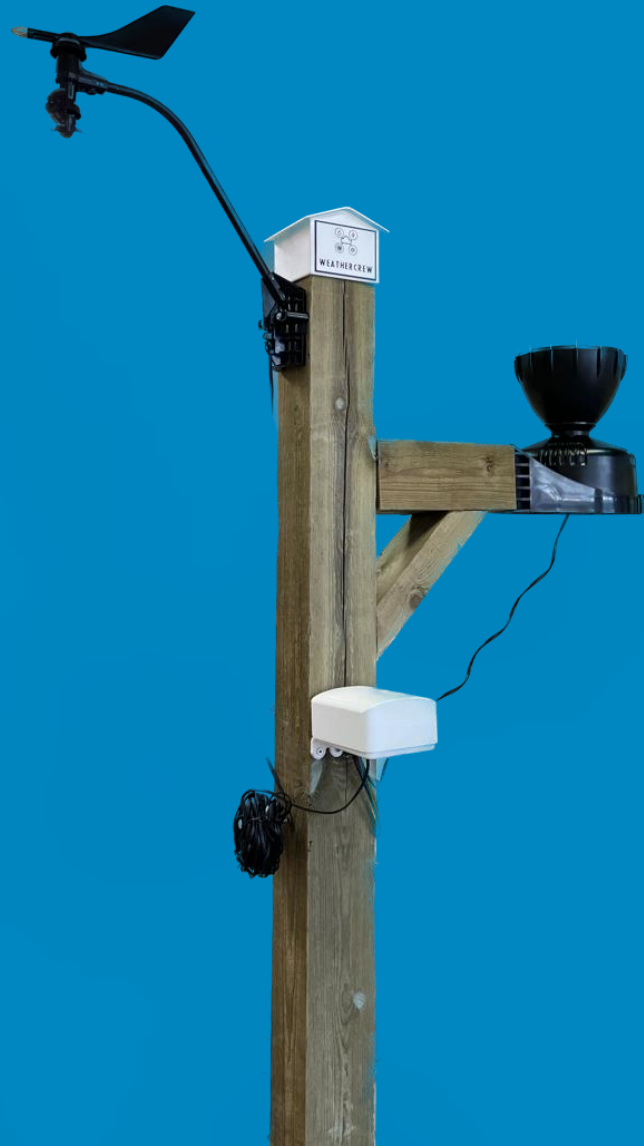
Temperature/ humidity sensor



Questions

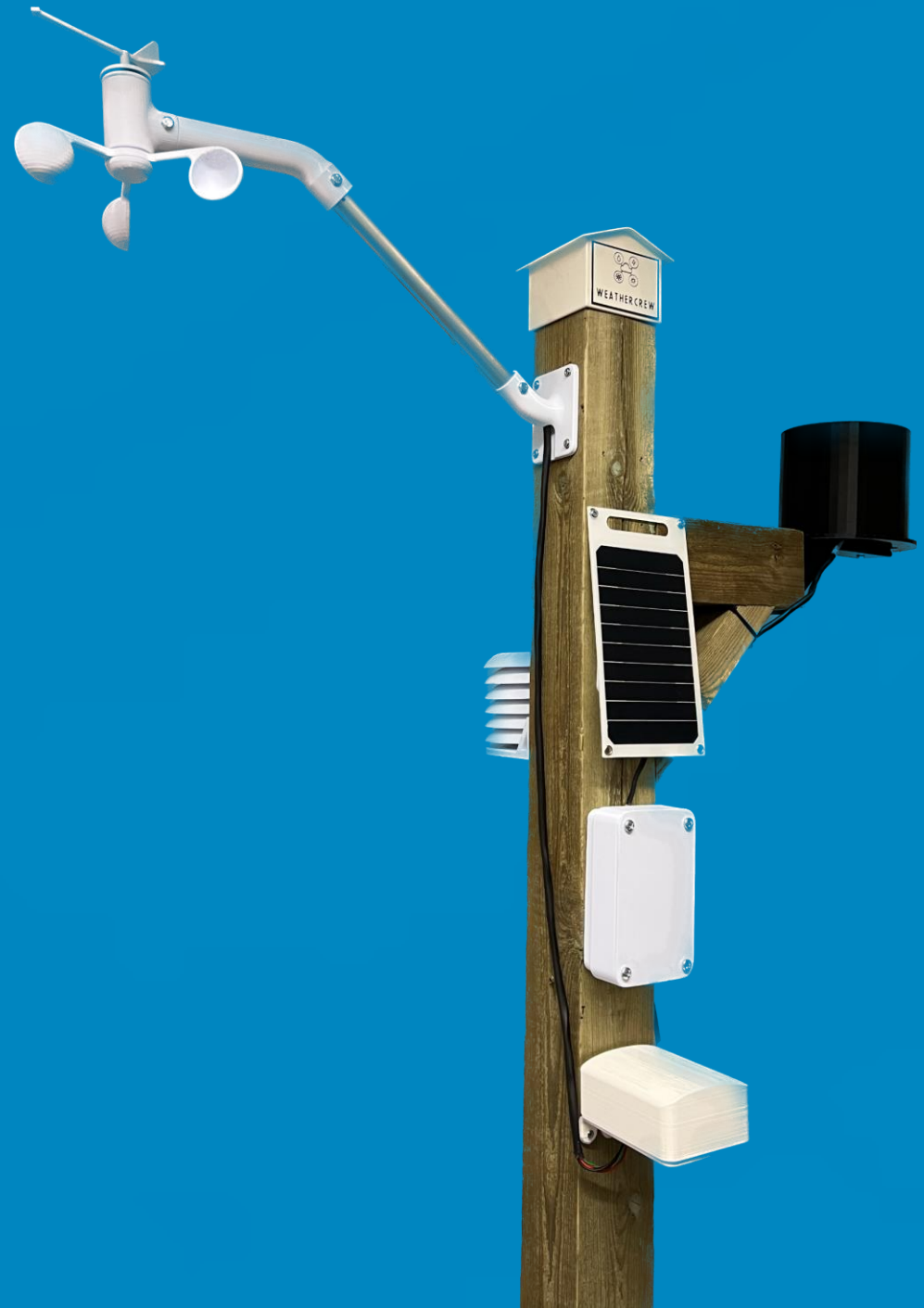
Prototype V2

Prototype V2

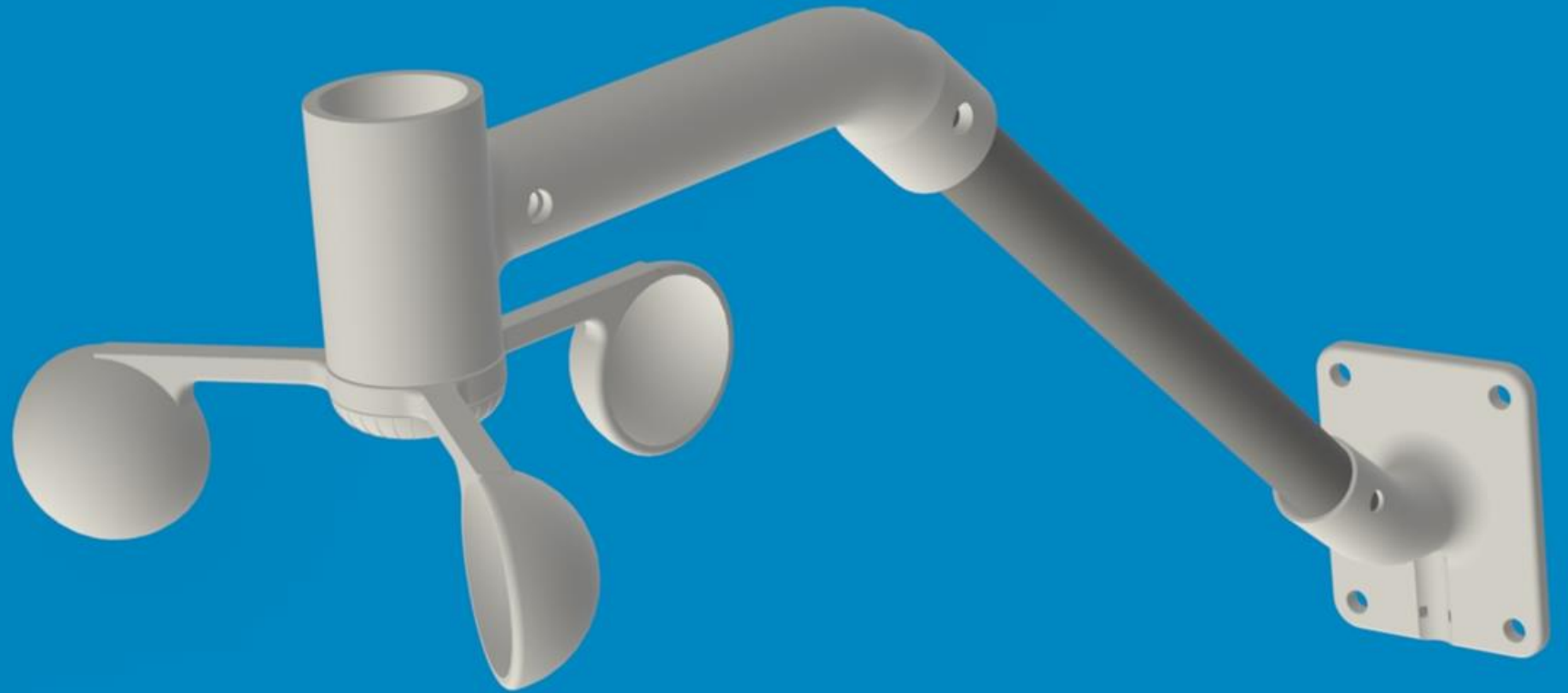


Prototype V2

- Wind speed sensor
- Wind direction sensor
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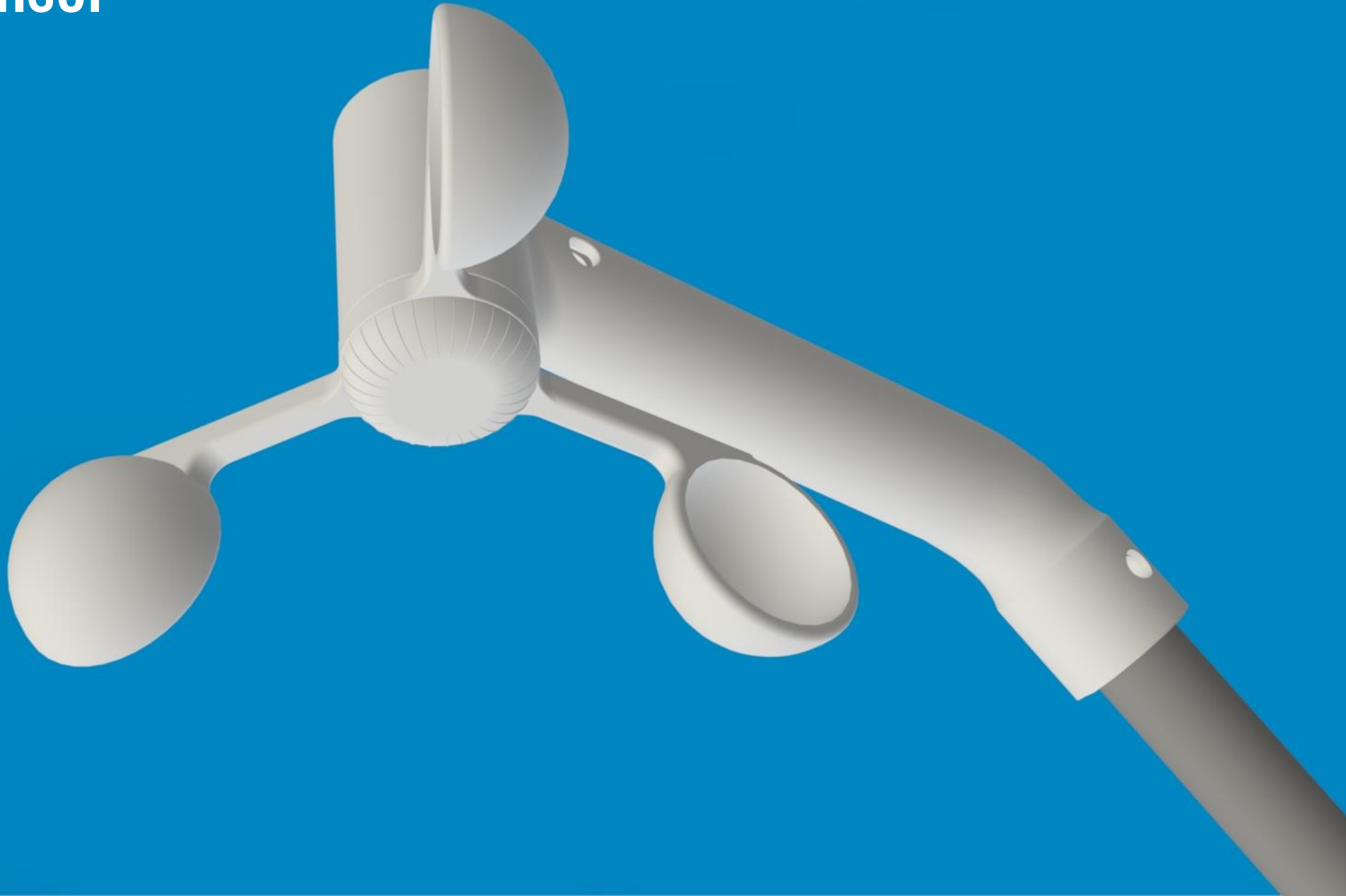


Wind speed sensor



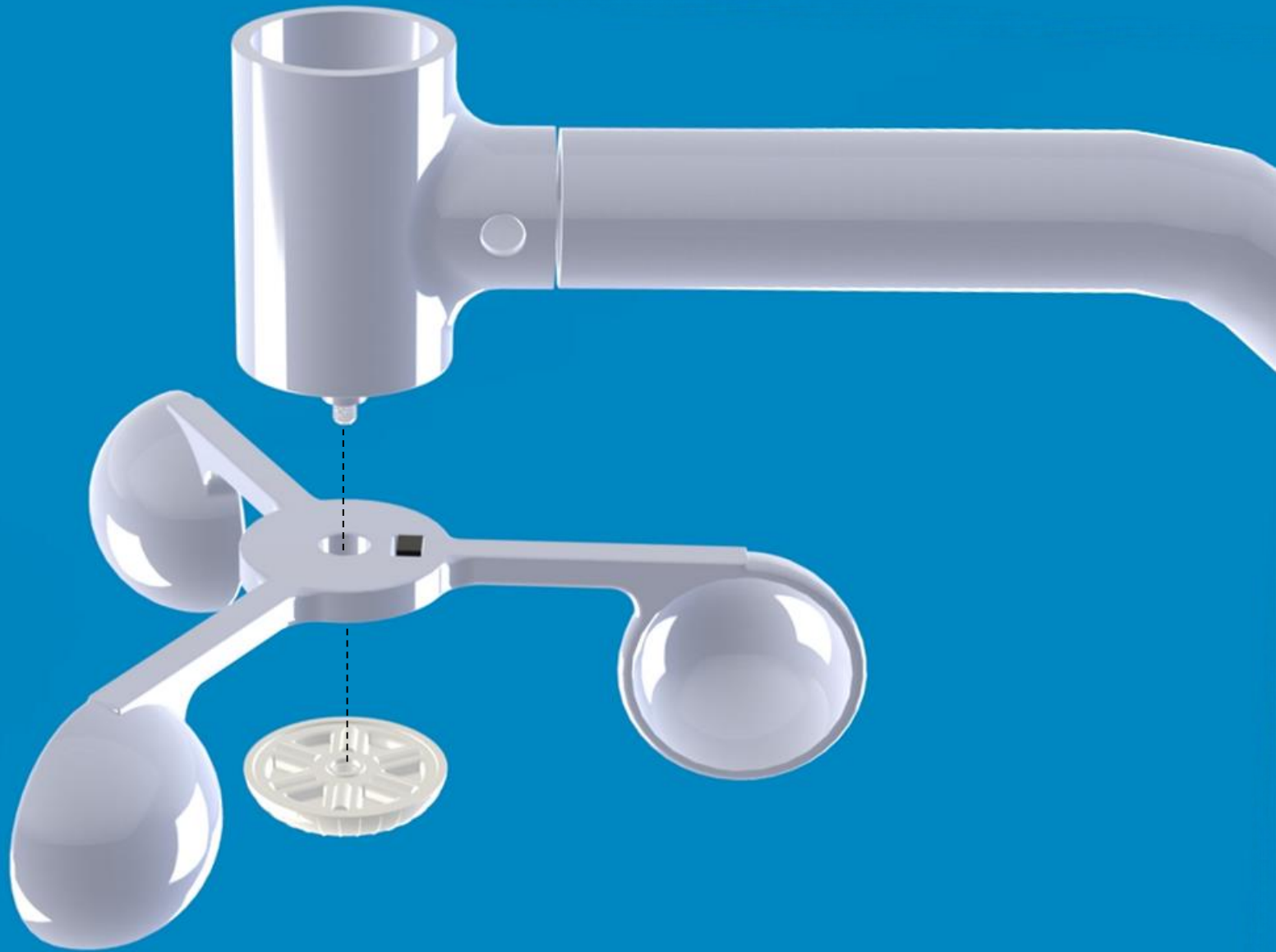
Wind speed sensor

Assembly



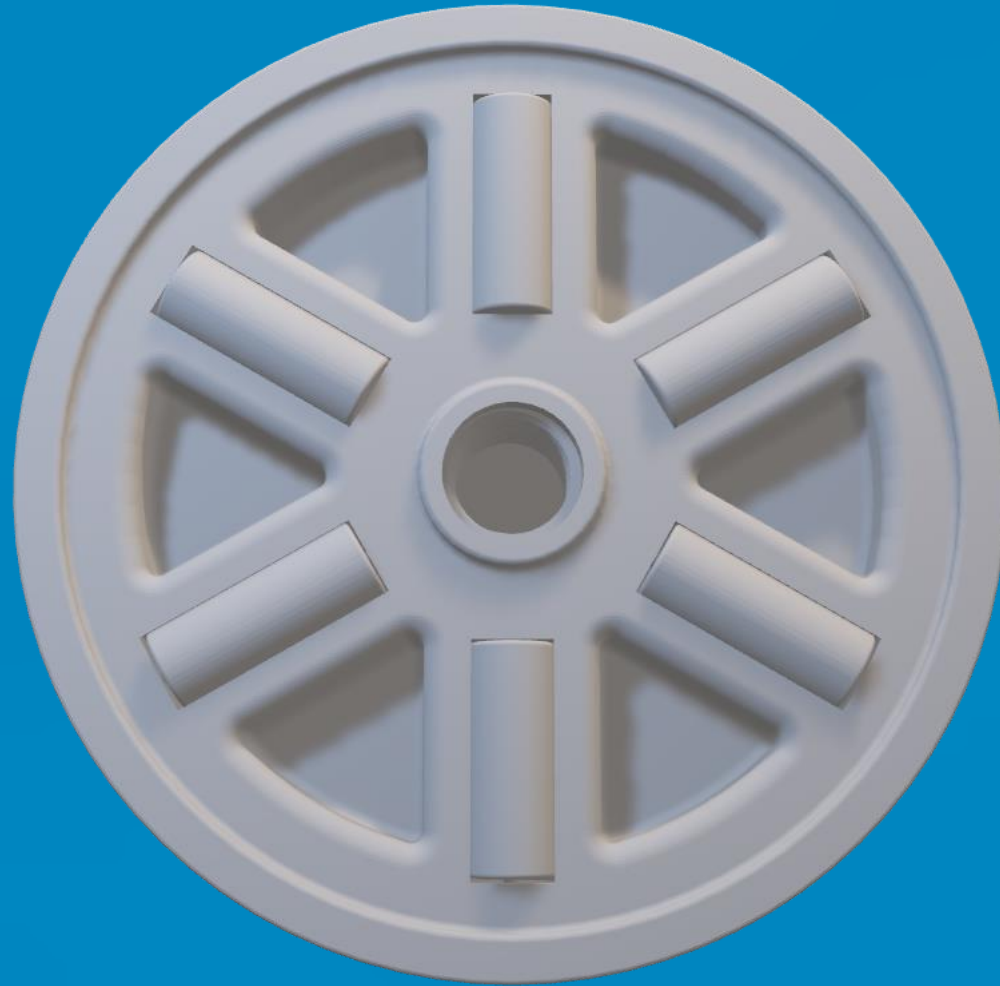
Wind speed sensor

Exploded view



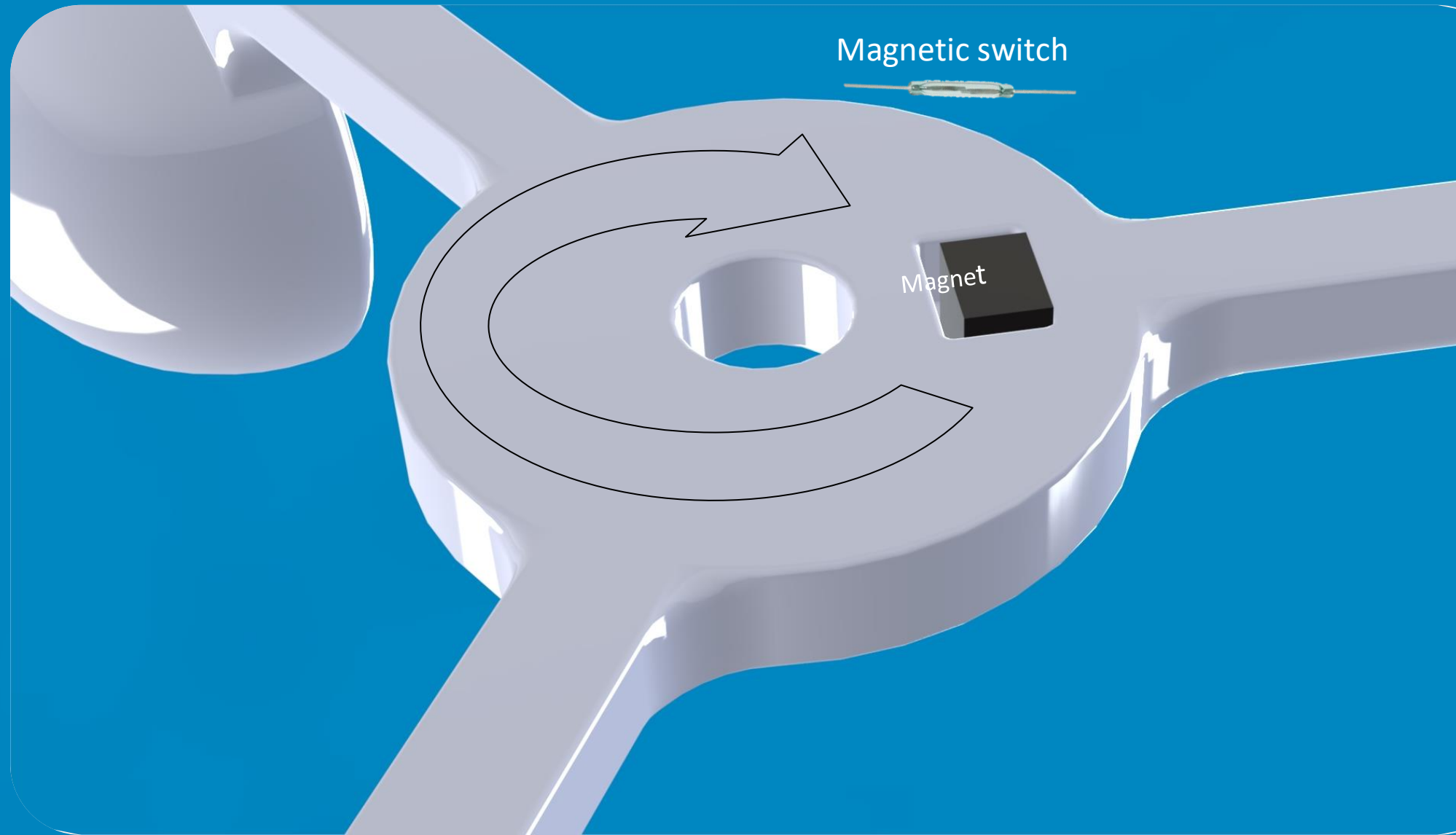
Wind speed sensor

Bearing cap



Wind speed sensor

How does it work?



Wind speed sensor

Code

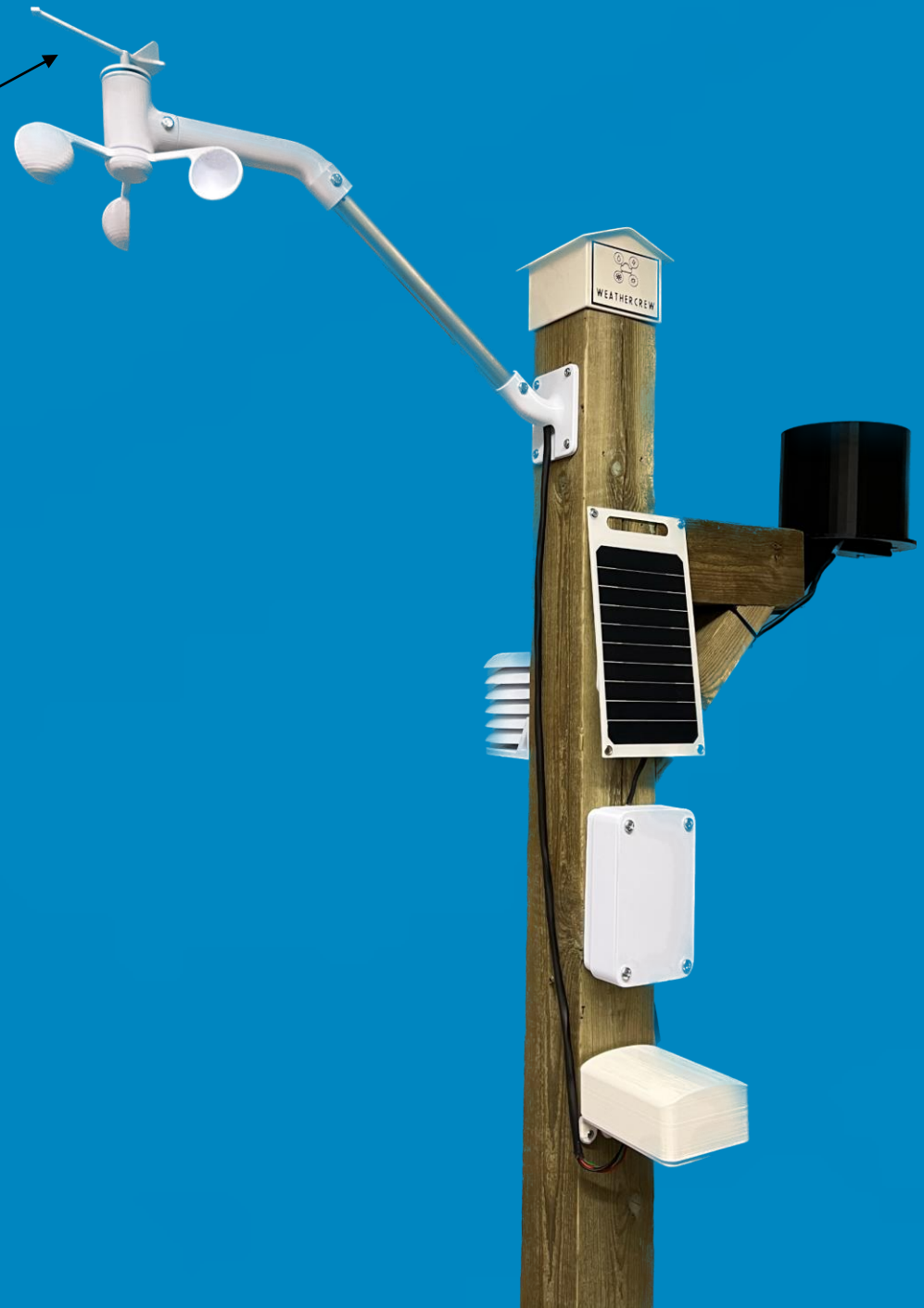
```
pinMode(WindSensorSpeedPin, INPUT_PULLUP);
attachInterrupt(digitalPinToInterrupt(WindSensorSpeedPin), isr_rotation, CHANGE);

// This is the function that the interrupt calls to increment the rotation count
void isr_rotation ()
{
    if ((millis() - ContactBounceTime) > 15 )
    {
        Serial.println("add rotation");
        Rotations++;
        ContactBounceTime = millis();
    }
}

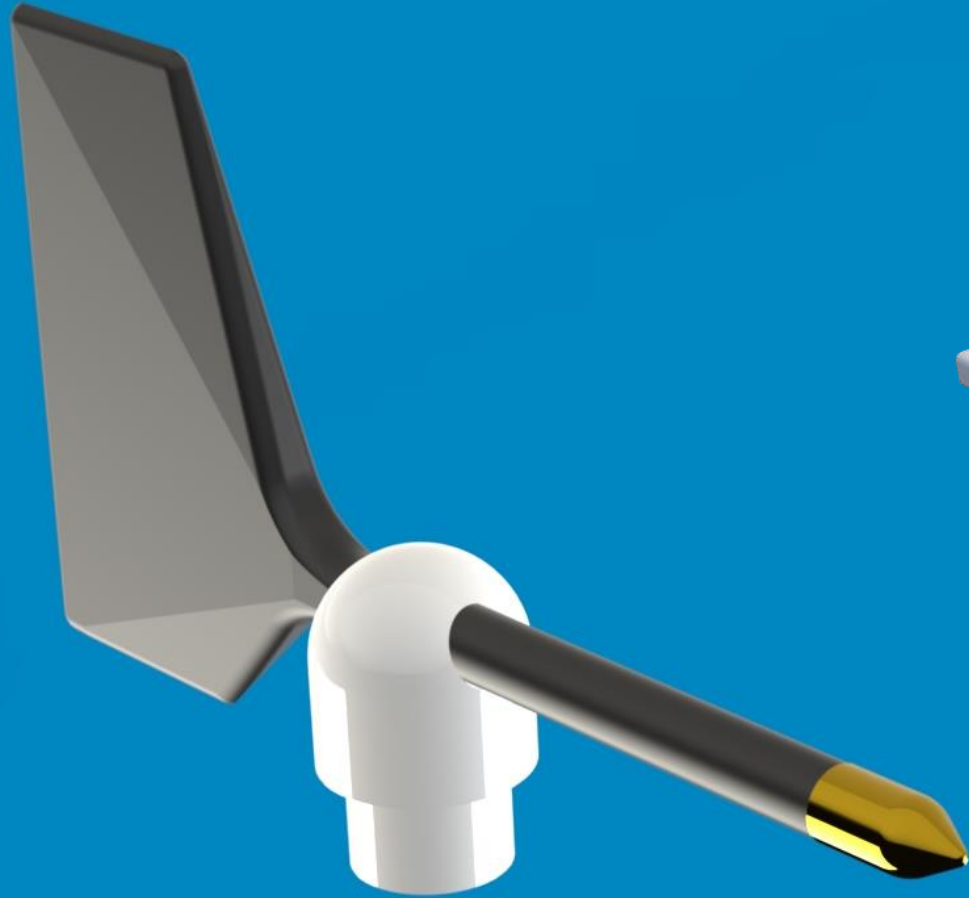
WindSpeedMPH = Rotations * 0.0375;
WindSpeedKPH = WindSpeedMPH * 1.609344;
Rotations = 0; // Set Rotations count to 0 ready for calculations
```

Prototype V2

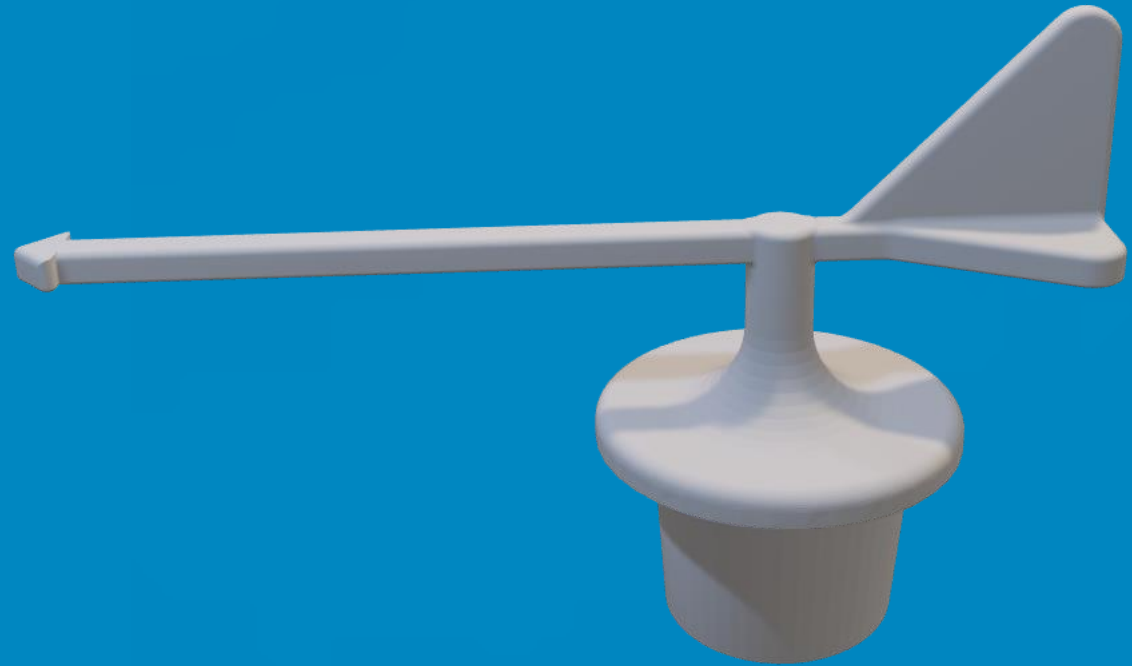
- Wind speed sensor
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Wind direction sensor



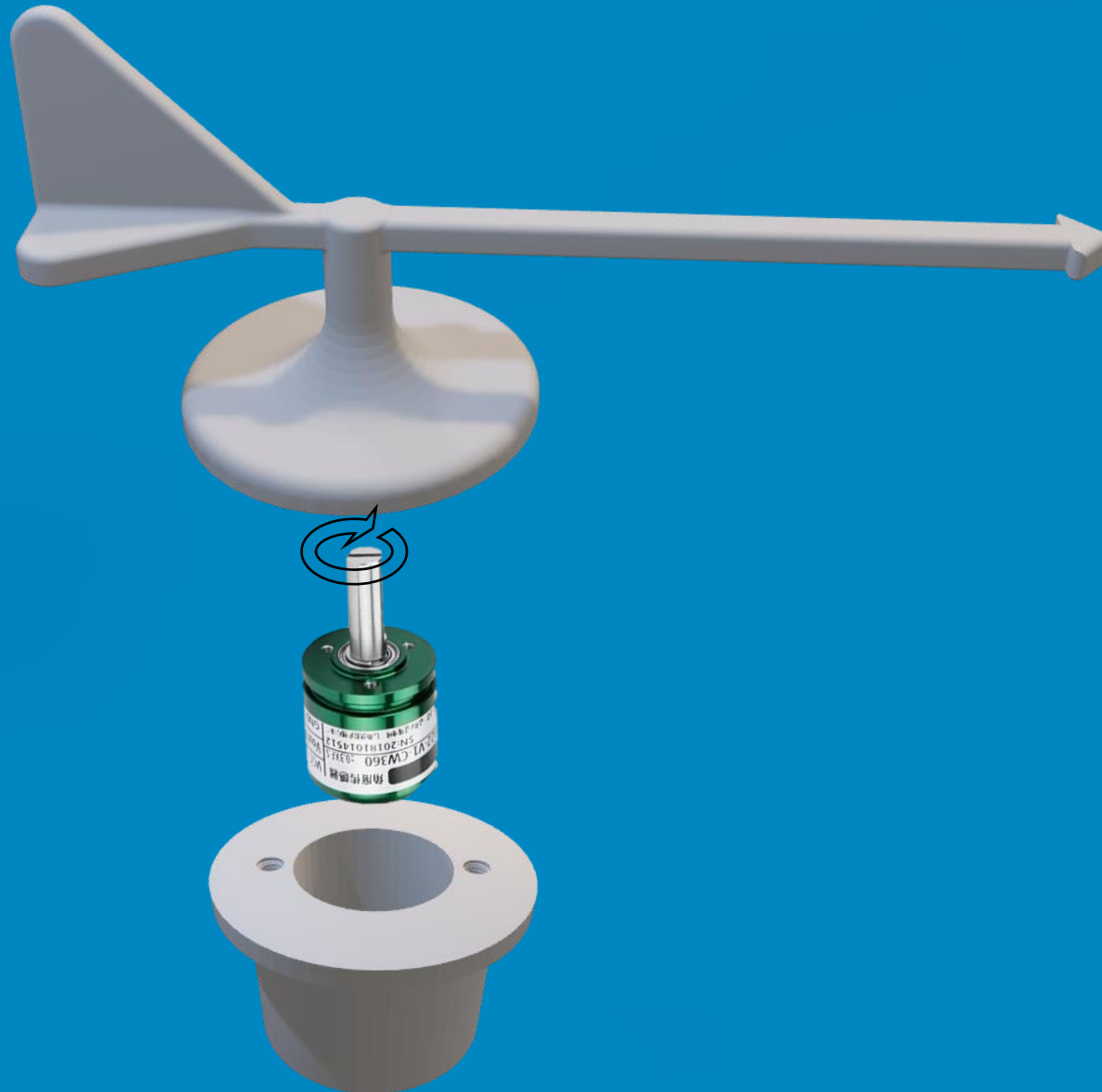
~500gr



~50gr

Wind direction sensor

How does it work?



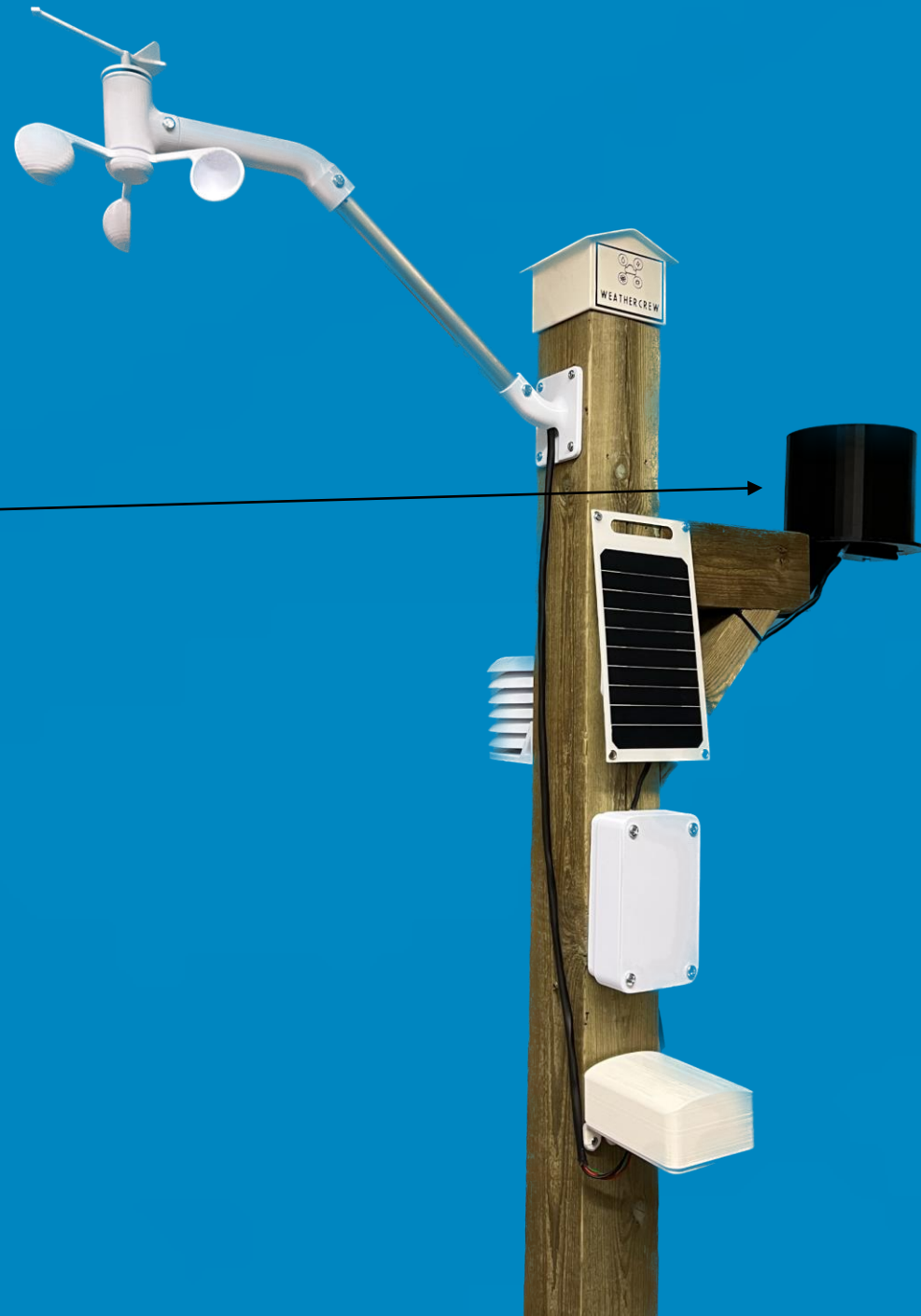
Wind direction sensor

Code

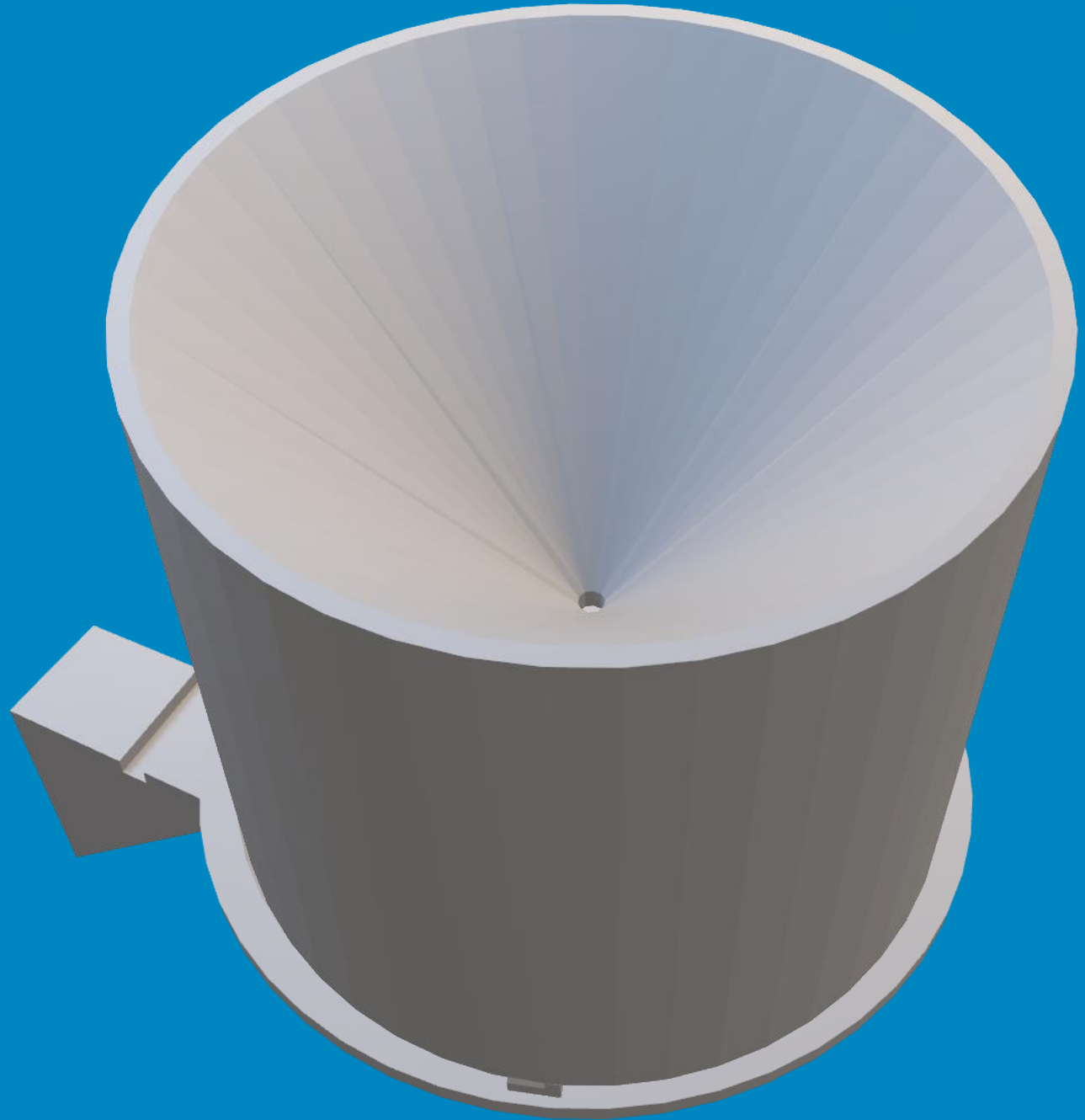
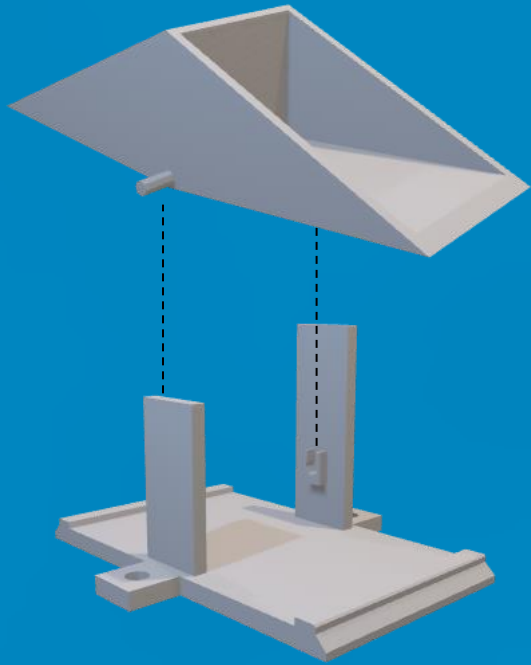
```
AnalogDirectionValue = analogRead(WindSensorDirectionPin);  
DirectionDegreesWithoutOffset = map(AnalogDirectionValue, 0, 1023, 0, 360);  
WindDirectionDegrees = DirectionDegreesWithoutOffset + WindDirectionOffset;  
  
if (WindDirectionDegrees > 360)  
{  
    WindDirectionDegrees = WindDirectionDegrees - 360;  
}  
  
if (WindDirectionDegrees < 0)  
{  
    WindDirectionDegrees = WindDirectionDegrees + 360;  
}
```

Prototype V2

- Wind speed sensor
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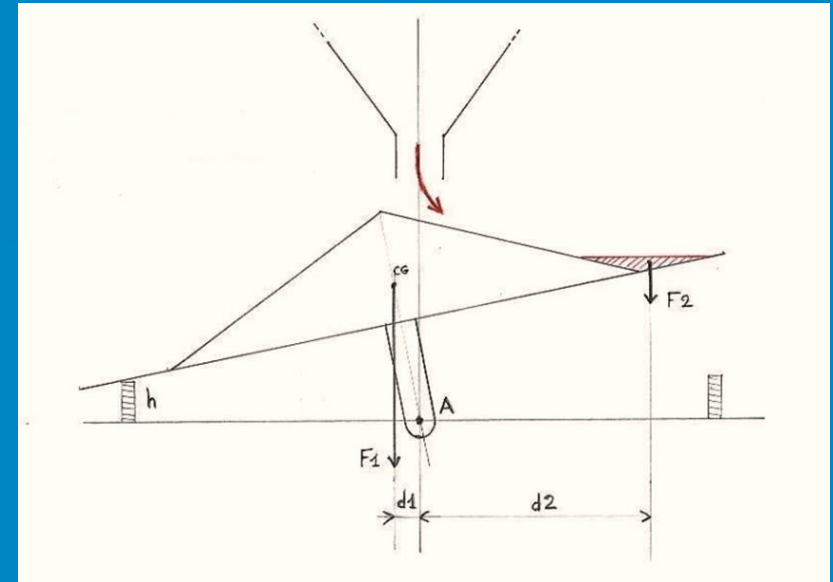
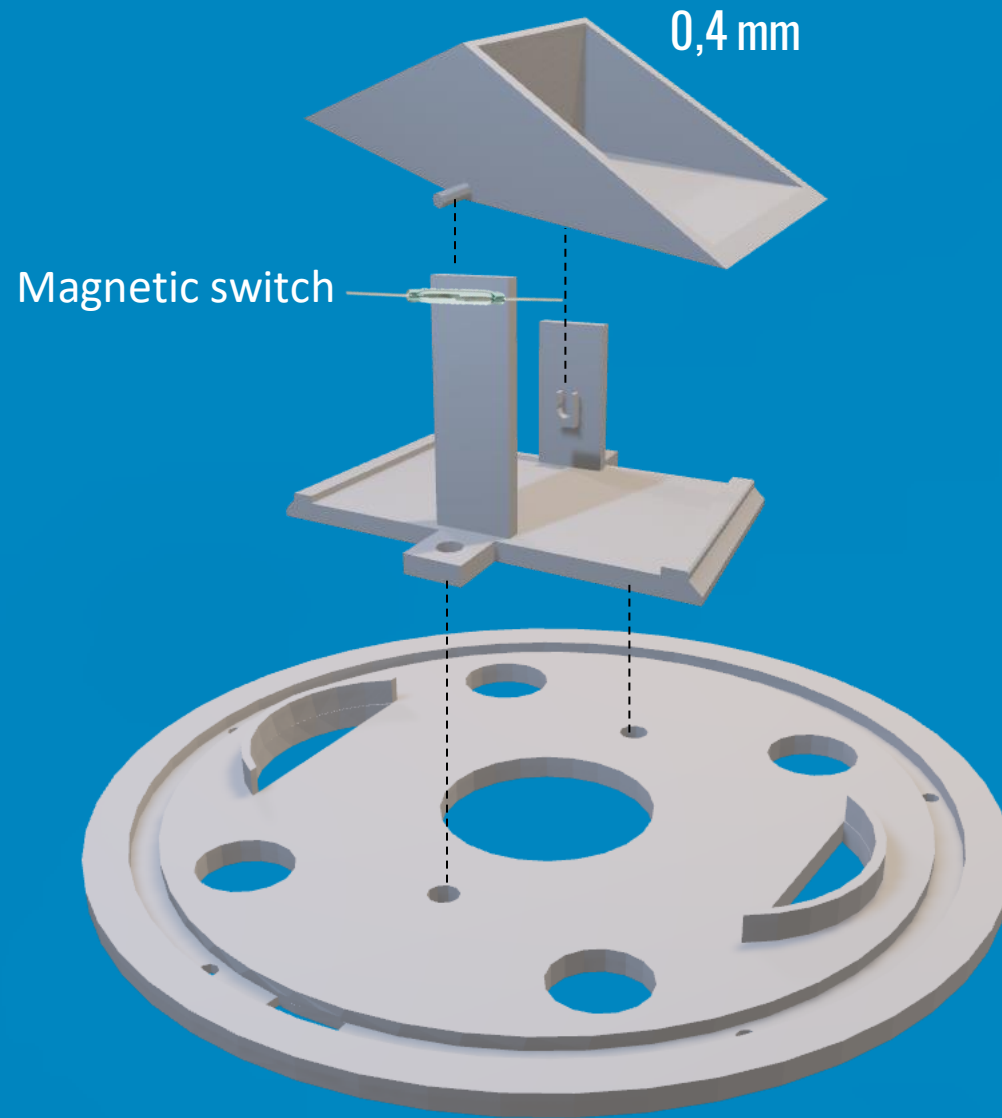


Rain sensor



Rain sensor

How does it work?



$$F_2 \times d_2 > F_1 \times d_1$$

Rain sensor

Code

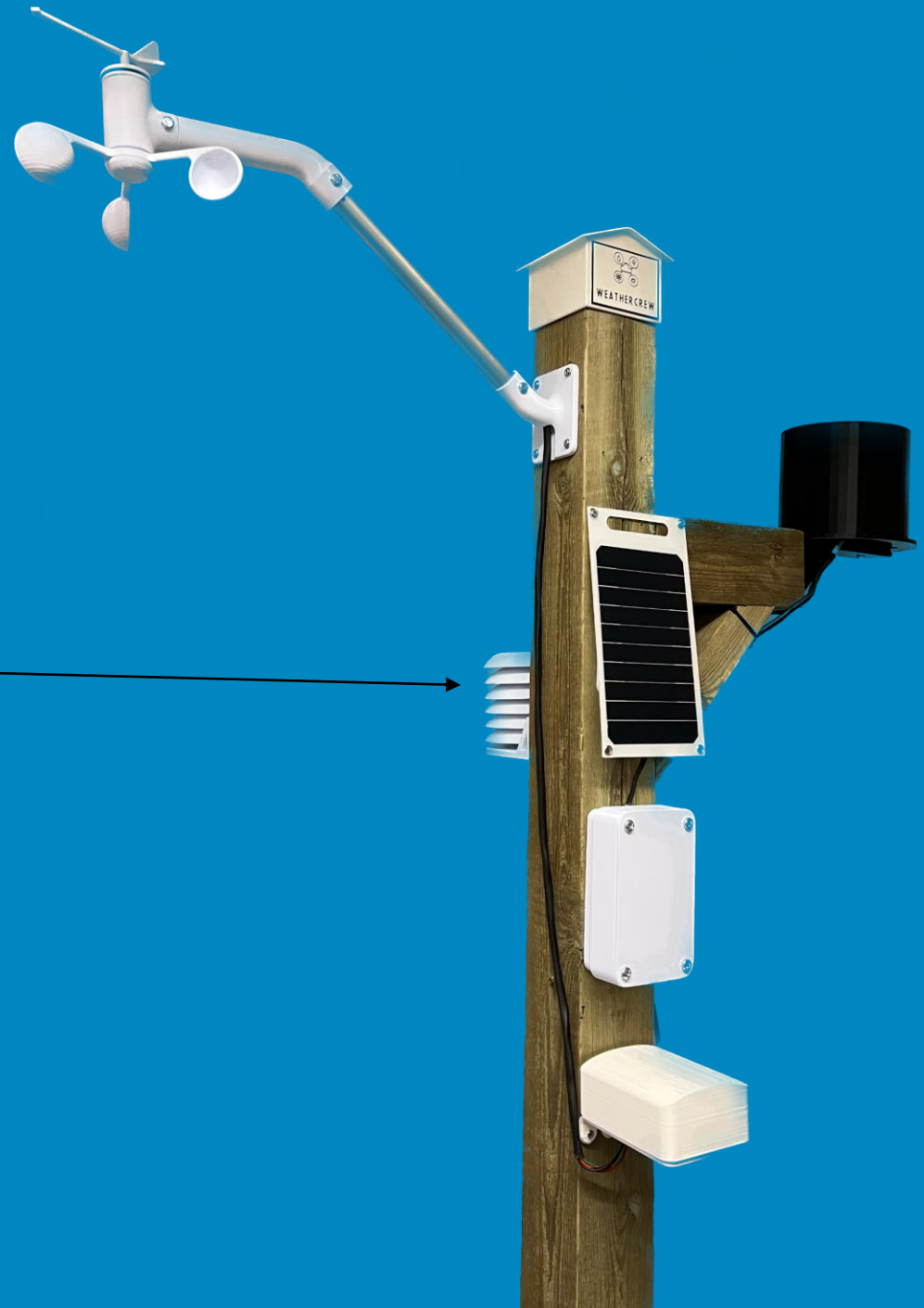
```
pinMode(RainSensorPin, INPUT_PULLUP);
attachInterrupt(digitalPinToInterrupt(RainSensorPin), isr_bucket, CHANGE);

// This is the function that the interrupt calls to increment the bucket tips
void isr_bucket ()
{
    if ((millis() - ContactBounceBucketTime) > 1000 )
    {
        Serial.println("add bucketAmount");
        Rain += bucketAmount;
        ContactBounceBucketTime = millis();
    }
}

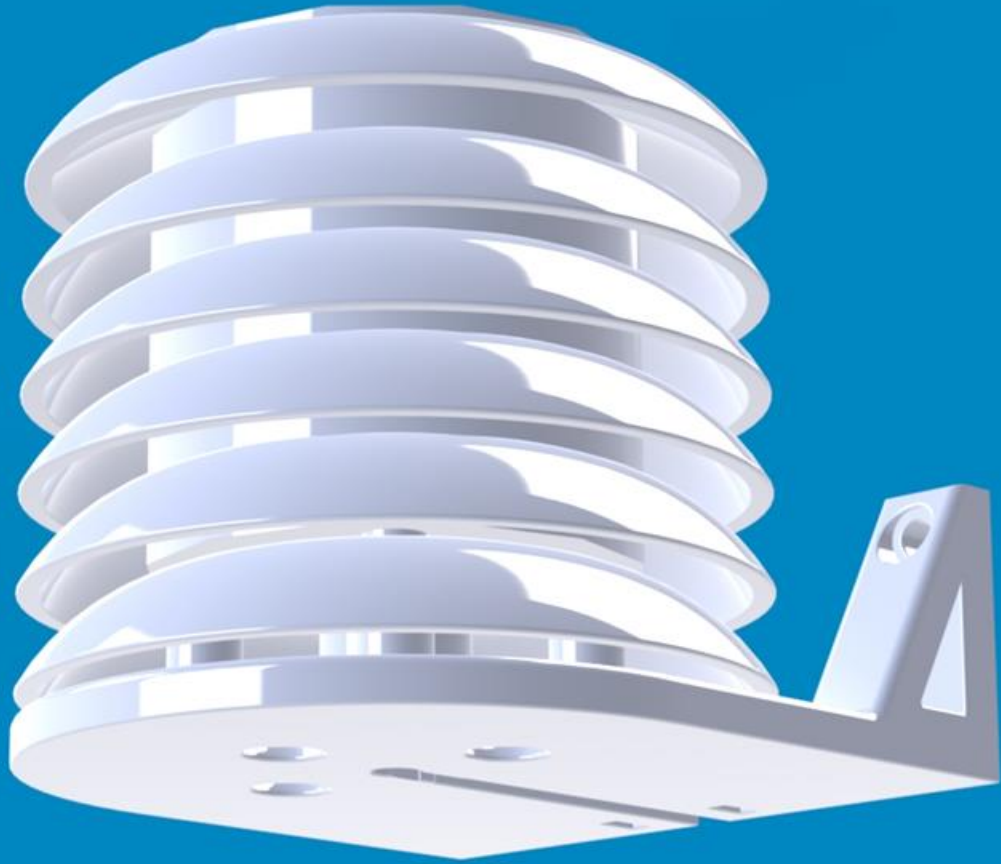
Rain = 0.0;
```

Prototype V2

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Temperature/humidity sensor

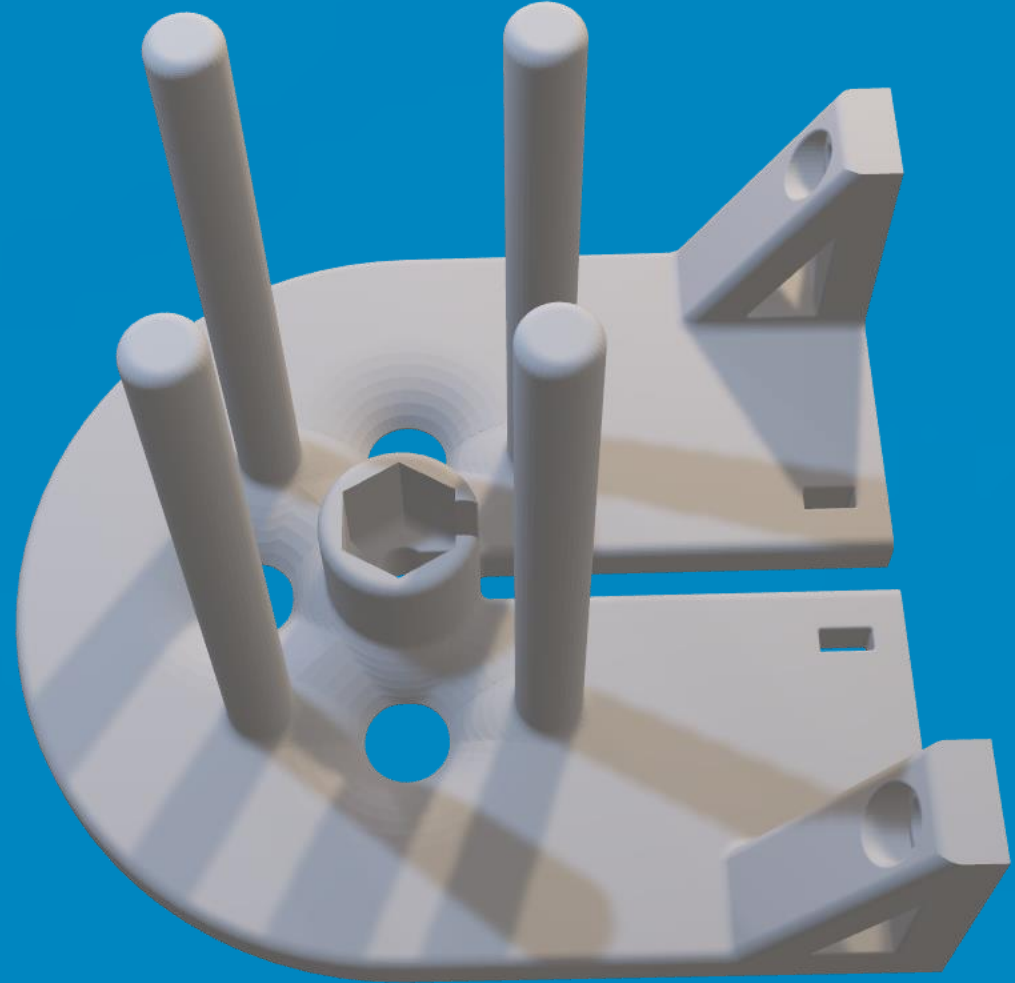


Temperature/humidity sensor

How does it work?



Temperature: -60 to 80 °C
Humidity: 0 to 100%



Temperature/humidity sensor Code

```
#include <Adafruit_SHT31.h>
```

```
Adafruit_SHT31 sht35 = Adafruit_SHT31(); // initialize the library instance
```

```
if (! sht35.begin(0x44))
```

```
{
```

```
    Serial.println("Couldn't find SHT35");
```

```
    while(1);
```

```
}
```

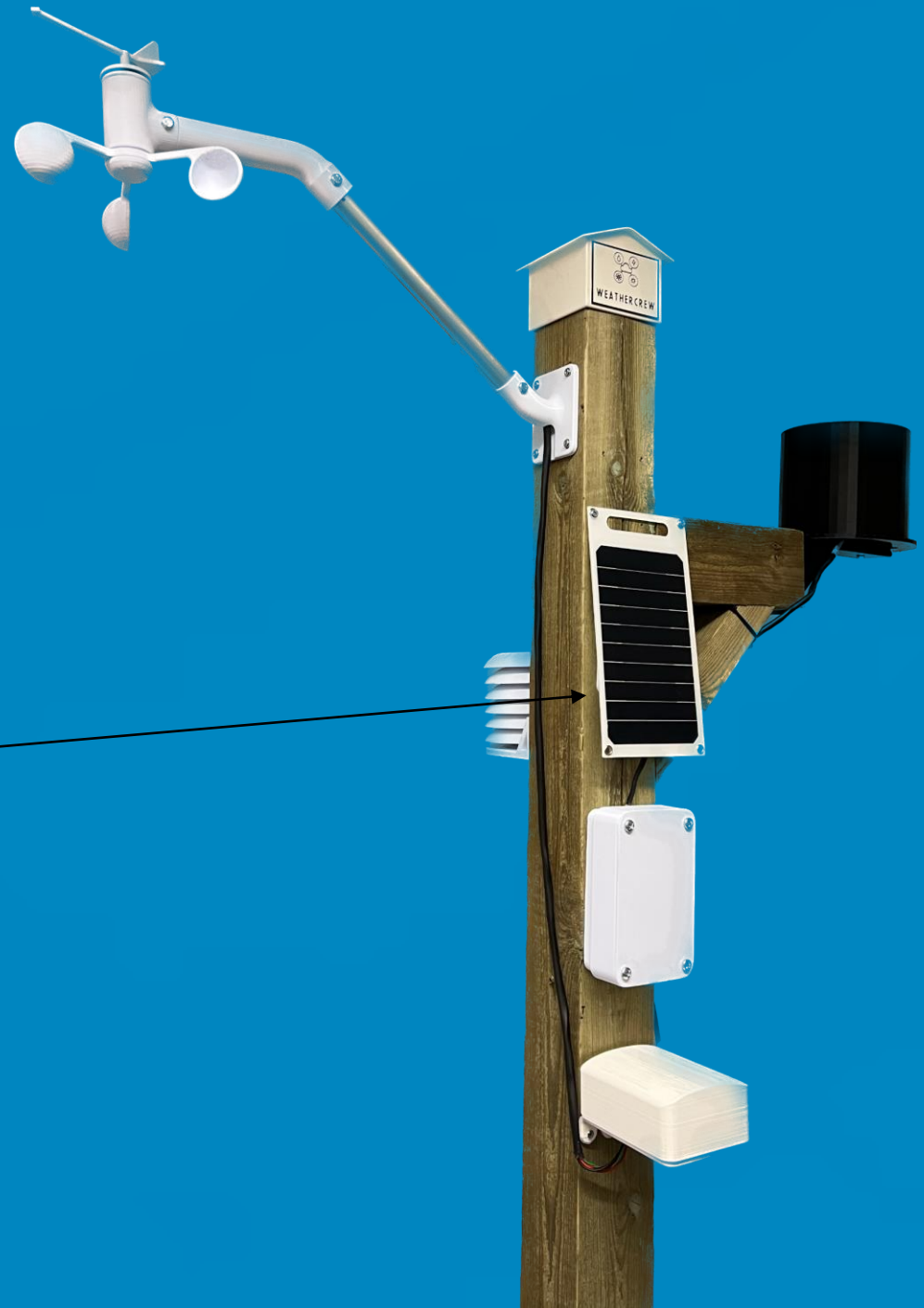
```
// Read the temperature and the humidity:
```

```
float tempC = sht35.readTemperature();
```

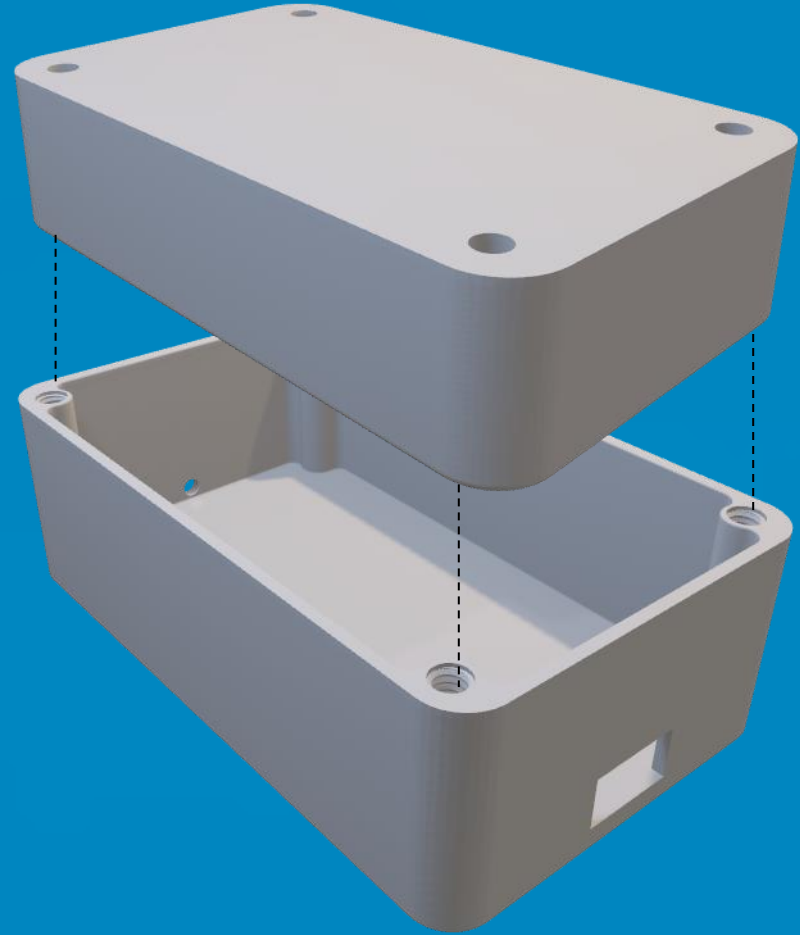
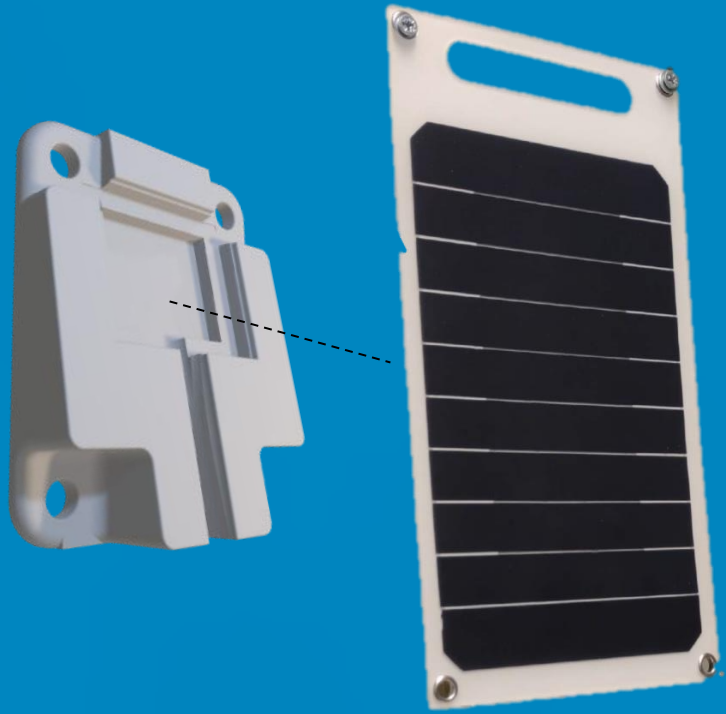
```
float humidity = sht35.readHumidity();
```

Prototype V2

- Wind speed sensor
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Solar power



Solar power

How does it work?



Solar power
manager



5V 10W

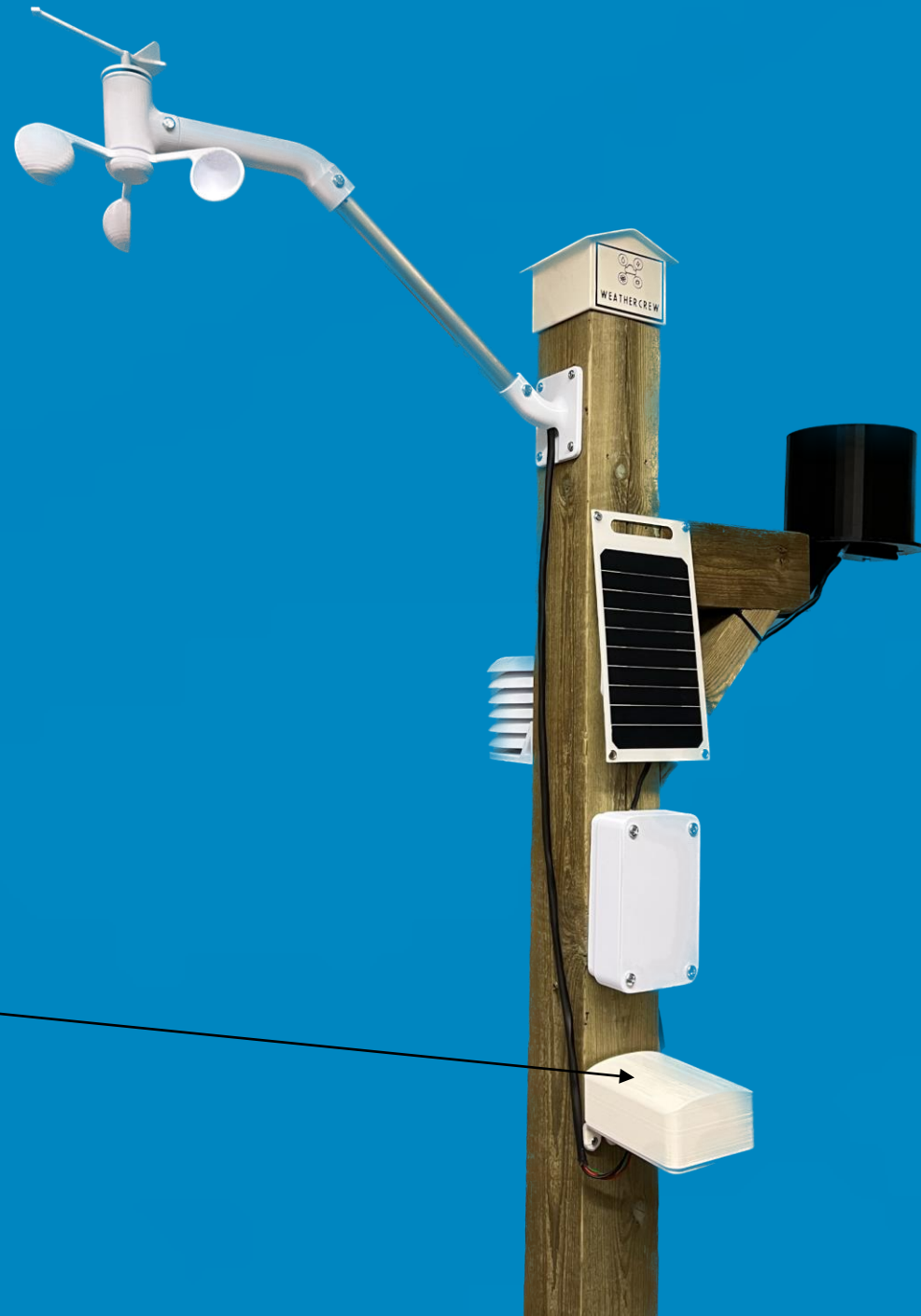
Arduino Nb-IoT

3.63V 14000mAh
~150 days



Prototype V2

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Low power code

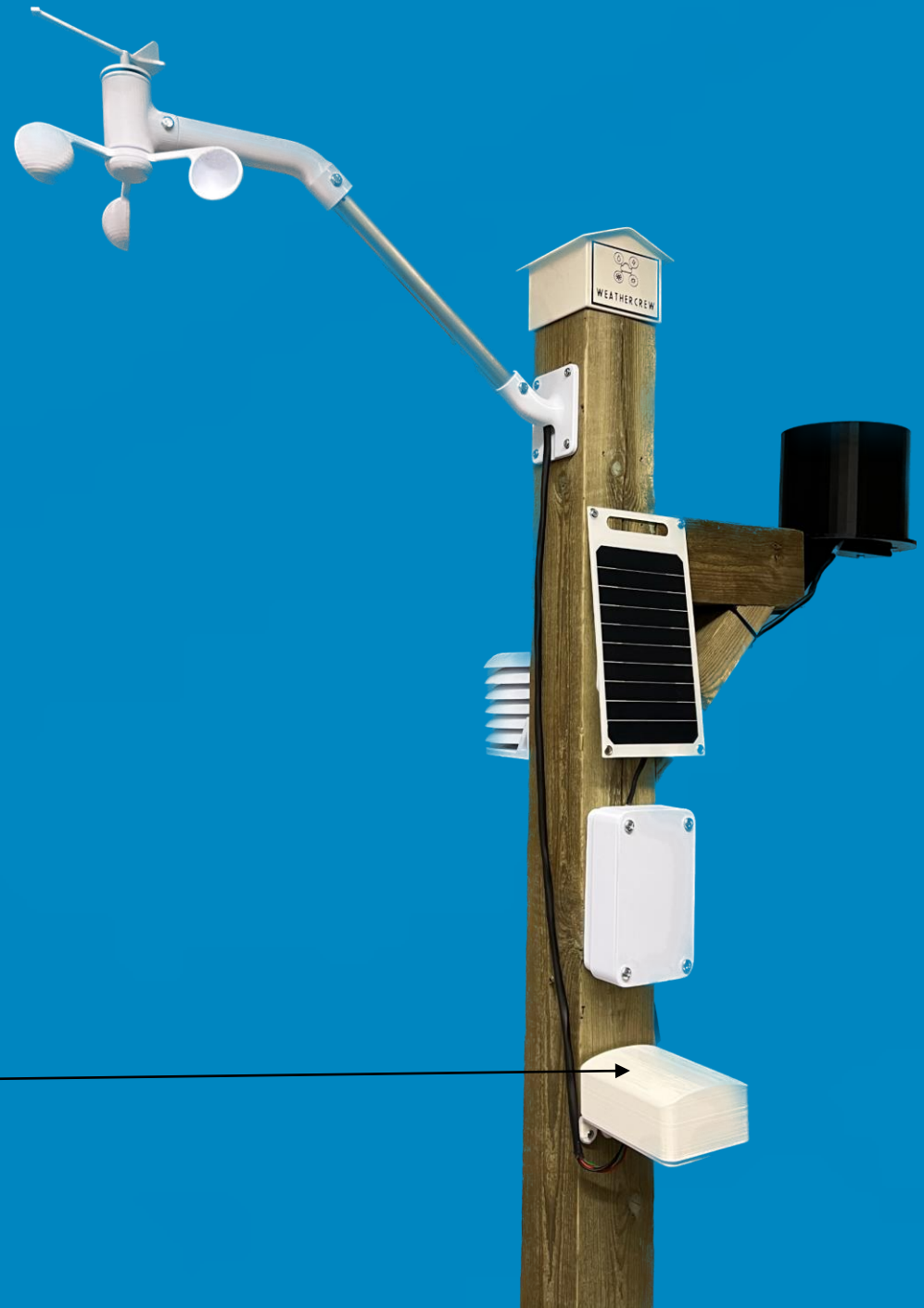
```
Serial.println("Go to sleep");
```

```
LowPower.deepSleep(interval);
```

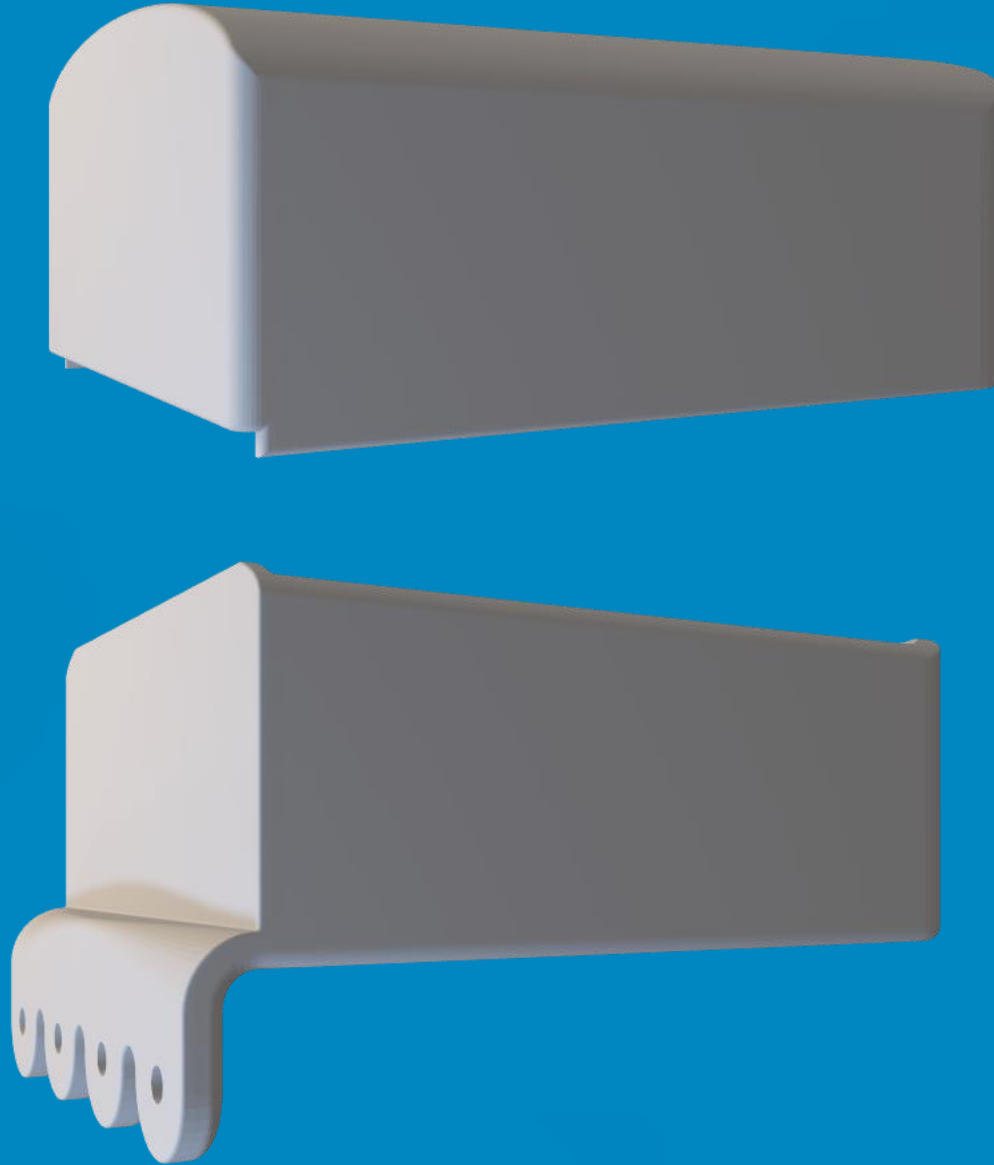
```
Serial.println("Wake up");
```

Prototype V2

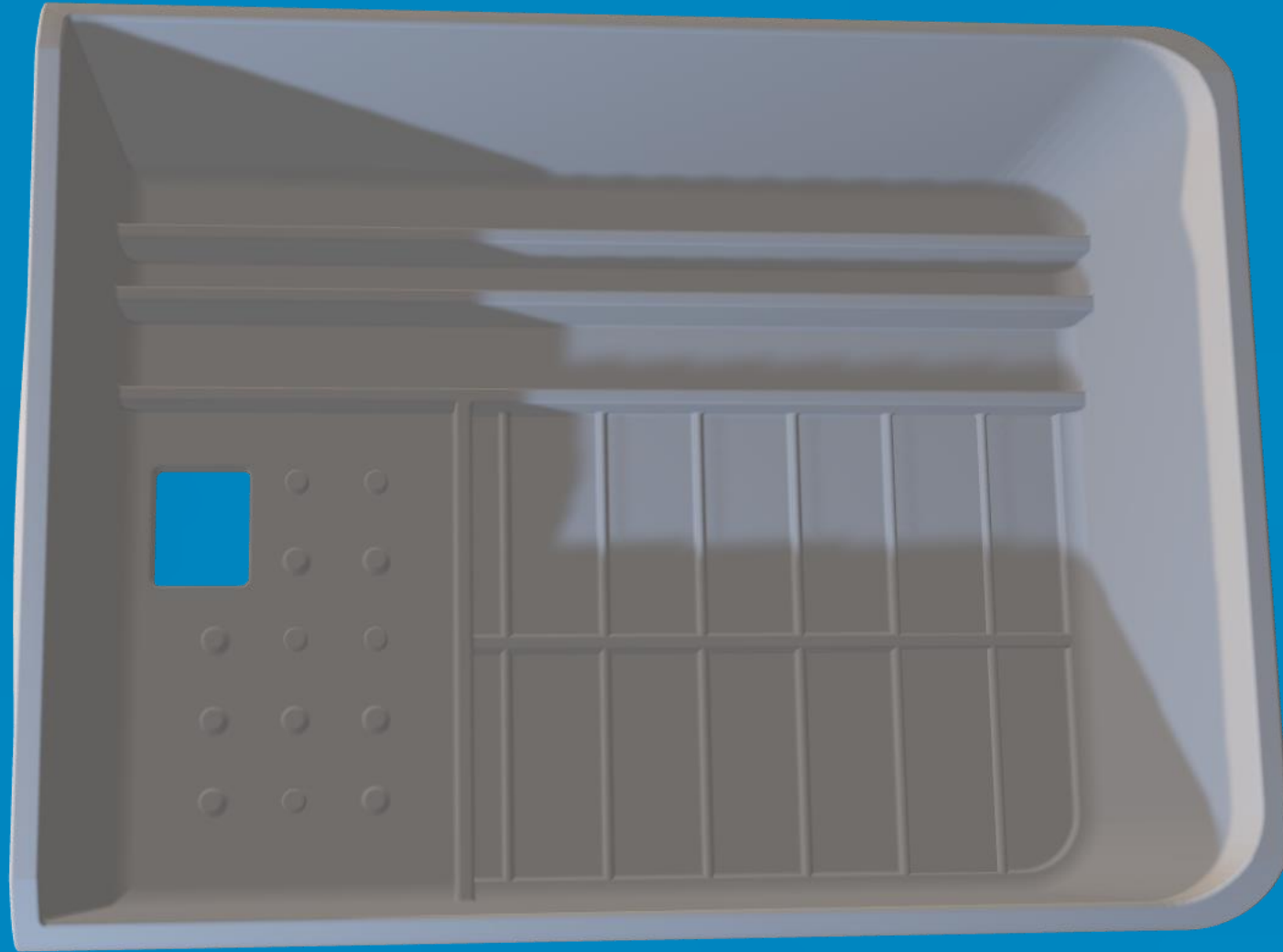
- Wind speed sensor
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Arduino box



Arduino box



Prototype V2

Demonstration



Poster

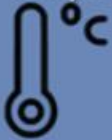


IoT weather station

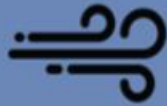
YRKESHÖGSKOLAN
NOVIA

What does the weather station Measure?

Temperature



Windspeed



Humidity



Wind direction



Rainfall

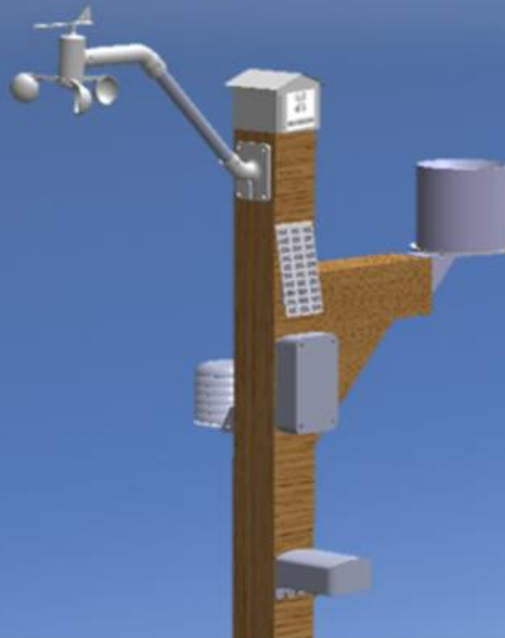


Solar powered



Project goal

Build a self-designed, low-cost, internet of things, low energy use, moveable weather station.

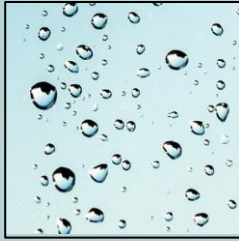


Who are we?

The weathercrew is a project team in an EPS project at Novia Yrkeshögskolan. We consist of Dutch and French students.

Curious about what the weather is?
Check it out right now!





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Temperature/ humidity sensor



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Reflections

Prices

Component V1	Price	Component V2	Price
Rain sensor	€120	Rain sensor	€28
Anemometer	€185	Anemometer	€49
Temperature/ humidity sensor	€5,50	Temperature/ humidity sensor	€20,70
		Solar power	€25

Reflections

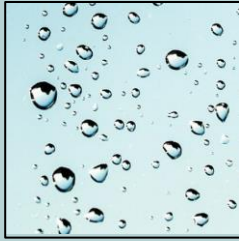
Difficulties

- Cheap products
 - Solar panel
 - Hall effect sensor
 - Delivery time
- Additive manufacturing (3D-printing)
 - Tolerances
 - Print time
 - Reserving

Reflections

Improvements

- Re-printing parts for better tolerance fitting
- Leaf protection rainfall sensor
- Low power improvement
- Add 'Omniá' snowdepth sensor
- Add self-made PCB
- Bigger wing on the wind vane



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Questions?

