

## Description

Expand your environmental monitoring and motion detection projects with the Arduino Portenta Proto Kit ME (Motion Environment). This kit integrates multiple Arduino Pro products, offering a complete toolkit for collecting data in applications such as predictive maintenance, asset tracking, smart building systems and industrial automation. Designed for reliability and efficiency, the kit features robust sensing capabilities and seamless Cloud connectivity enabled by the Arduino Pro 4G Module. Leverage the Portenta Proto Kit ME to accelerate your prototyping process and transition smoothly from functional prototypes to final products.

## Target Areas

Predictive maintenance, asset tracking, smart building systems, industrial automation, research and development

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## 1 Application Examples

The Arduino Portenta Proto Kit ME (Motion Environment) is not just a prototyping platform, it is a versatile toolkit for innovation in motion detection and environmental monitoring, designed for applications across industrial automation, smart buildings and logistics. Discover how the Portenta Proto Kit ME can bring your ideas to life through the following application examples:

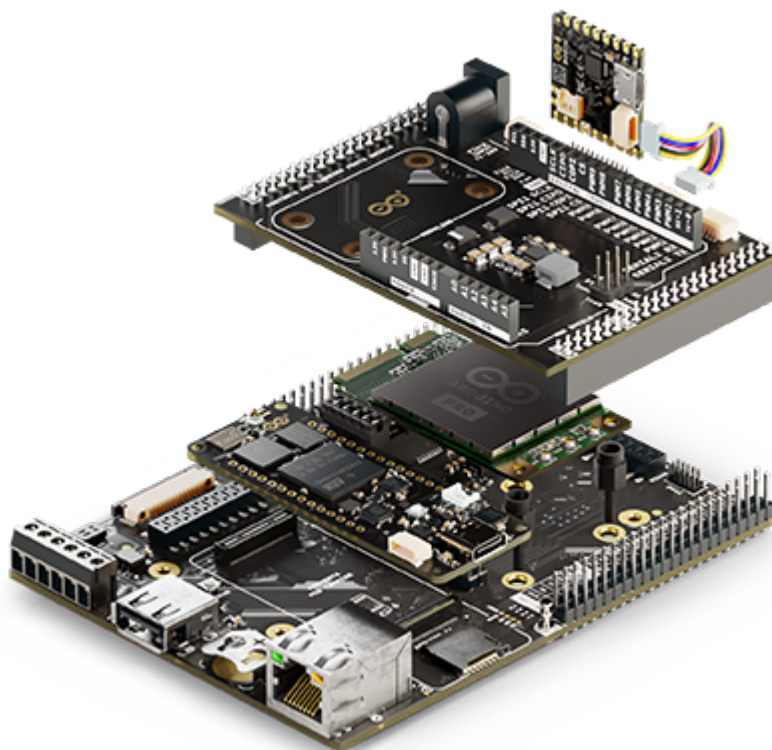
- **Industrial automation:** Enhance operational efficiency and reliability with the Portenta Proto Kit ME, offering solutions for:
  - **Predictive maintenance:** Use the Nicla Sense ME to collect environmental data such as temperature, humidity and motion to monitor equipment health. Combine this data with the Portenta H7 board for advanced processing and Cloud integration to detect anomalies, schedule proactive maintenance and minimize downtime.
  - **High-speed test rigs:** Design modular and scalable test benches for industrial applications, integrating motion detection, environmental monitoring and data exchange. Use the Portenta Proto Kit ME to perform sensor calibration, load testing and real-time functional evaluations, transmitting data to the Cloud for analysis.
  - **Remotely monitored machinery:** Build systems for real-time monitoring and control using the Nicla Sense ME for motion and environmental sensing. Integrate with the Portenta H7 board and leverage Cloud connectivity to monitor equipment status, adjust parameters and receive alerts remotely, ensuring efficient operations.
- **Building automation/smart cities:** Create smarter, more connected environments with the Portenta Proto Kit ME, enabling innovative solutions such as:
  - **Environmental monitoring:** Use the Nicla Sense ME to track indoor air quality, temperature and humidity in real time. Process the data locally with the Portenta H7 board to make informed decisions for optimizing indoor environments, improving comfort and ensuring energy efficiency.
  - **Intrusion detection systems:** Develop motion-sensitive security systems using the Nicla Sense ME to detect unauthorized movement or environmental anomalies. Send alerts to designated devices via the Arduino Pro 4G Module for immediate action and remote monitoring.
  - **Smart logistics:** Monitor goods in transit with the Nicla Sense ME to track motion, environmental conditions and vibration. Use cloud connectivity with the Portenta H7 board for seamless data transmission and analytics, enabling efficient logistics management and goods protection.
- **Smart mobility:** Enable innovative applications in transportation and logistics with advanced motion and environmental sensing:
  - **Vibration monitoring:** Use the Nicla Sense ME to detect vibrations during transit, ensuring the safety of delicate goods or identifying potential issues in vehicle performance.
  - **Route optimization:** Collect motion and environmental data to optimize delivery routes, integrating real-time insights through Cloud analytics for enhanced operational efficiency.

## 2 Features

### 2.1 Kit Contents

The Arduino Portenta Proto Kit ME includes all the hardware components necessary to prototype motion detection and environmental monitoring applications effectively. Below is the list of included items:

- Portenta H7 (x1)
- Nicla Sense ME (x1)
- Portenta Mid Carrier (x1)
- Portenta Mid Carrier Proto Shield (x1)
- Arduino Pro 4G Module (x1)
- Modulinos (x6):
  - KNOB (x1)
  - PIXELS (x1)
  - DISTANCE (x1)
  - MOVEMENT (x1)
  - BUTTONS (x1)
  - BUZZER (x1)
  - THERMO (x1)



*Exploded view of the Portenta Proto Kit ME, showcasing most of the kit's components.*

## 2.2 General Specifications Overview

The Arduino Portenta Proto Kit ME integrates advanced sensors, connectivity modules, and versatile prototyping shields. Designed for industrial automation, smart buildings, and logistics, the kit enables efficient motion detection and environmental monitoring solutions.

Below are the main features and specifications of the kit's components. For detailed specifications of each individual component, please refer to the corresponding documentation available on Arduino Docs.

Feature	Description
<b>Portenta H7</b>	Dual-core microcontroller board with ARM Cortex® M7 at 480 MHz and M4 at 240 MHz. Includes advanced graphics capabilities and operates in an industrial temperature range (-40 °C to 85 °C).
<b>Nicla Sense ME</b>	Compact board (22.86 mm x 22.86 mm) with sensors for motion, pressure, temperature, humidity and indoor air quality. Features Bluetooth® connectivity and edge AI capabilities.
<b>Portenta Mid Carrier</b>	Expands connectivity with Ethernet, USB-A, mPCIe, CAN, MicroSD and 4G. Includes JTAG pins for debugging and supports I2C, SPI, PWM, digital and analog I/Os.
<b>Mid Carrier Proto Shield</b>	Supports Nicla family boards, Modulinos, Arduino UNO shields, ESLOV connectors (x2), and Qwiic connector (x1).
<b>Arduino Pro 4G Module</b>	Provides global LTE Cat.4 connectivity, 4G support and GNSS capabilities.
<b>Modulinos</b>	Includes: KNOB (encoder with push button), PIXELS (8x RGB LEDs), DISTANCE (Time-of-Flight sensor), MOVEMENT (6-axis IMU), BUTTONS (3x push buttons and LEDs), BUZZER and THERMO (temperature and humidity sensor).
<b>Power Input Voltage</b>	+7-30 VDC via the Portenta Mid Carrier Proto Shield power jack, +5 VDC via USB-C® on the Portenta H7 or Portenta Mid Carrier terminal pins.

## 2.3 Included Accessories

- 4G antenna (x2)
- GNSS antenna (x1)

## 2.4 Related Products

- Arduino Nicla Voice (SKU:ABX00061)
- Arduino Nicla Vision (SKU: ABX00051)
- Arduino Portenta C33 (SKU: ABX00049)
- Arduino X8 (SKU:ABX00074)
- Arduino USB Type-C® Cable 2-in-1 (SKU: TPX00094)

## 3 Ratings

### 3.1 Recommended Operating Conditions

The table below provides a comprehensive guideline for the optimal use of the Arduino Portenta Proto Kit ME, outlining typical operating conditions and design limits. The operating conditions of the Portenta Proto Kit ME are largely a function based on its component's specifications.

Parameter	Symbol	Min	Typ	Max	Unit
Input Voltage of the Power Jack Connector <sup>1</sup>	V <sub>PJC</sub>	7.0	-	30	V
Operating Temperature <sup>2</sup>	T <sub>OP</sub>	-40	-	85	°C

<sup>1</sup> Onboard power jack connector of the Portenta Mid Carrier Proto Shield.

<sup>2</sup> The operating temperature represents the range for the entire kit and not just an individual component.

**Note:** While the kit can be powered through different pins and connectors, the recommended method is to use the power jack connector of the Portenta Mid Carrier Proto Shield. Any alternative power options should be carefully evaluated by consulting the individual power specifications of each component to avoid potential damage.

### 3.2 Power Supply

The Arduino Portenta Proto Kit ME can be powered through one of the following recommended methods:

- **Portenta Mid Carrier Proto Shield onboard power jack:** Provides a dedicated connection to power the kit using a +7 to 30 VDC input.
- **USB-C® connector on the Portenta H7 board:** Allows powering the kit with +5 VDC through the Portenta H7's USB-C® port or the terminal pins on the Portenta Mid Carrier.

**Tip:** To ensure reliable performance, always prioritize using the dedicated power jack on the Portenta Mid Carrier Proto Shield for configurations requiring higher power stability.

**Safety Note:** Always disconnect power before making hardware changes to the kit. Ensure that power specifications are within the recommended limits to avoid damage to components.



## 4 Device Operation

### 4.1 Getting Started - IDE

If you want to program your Arduino Portenta Proto Kit ME offline, install the Arduino Desktop IDE **[1]**. To connect the Portenta H7 to your computer, you will need a USB-C® cable. Additionally, to program or interact with the Nicla Sense ME, ensure you have a Micro USB cable compatible with the board.

### 4.2 Getting Started - Arduino Cloud Editor

All components of the Portenta Proto Kit ME work seamlessly on the Arduino Cloud Editor **[2]** by installing a simple plugin. The Arduino Cloud Editor is hosted online, ensuring it is always up-to-date with the latest features and support for all boards and devices. Follow **[3]** to start coding in the browser and upload your sketches onto the Portenta H7 or other components.

### 4.3 Getting Started - Arduino Cloud

The Portenta Proto Kit ME is fully supported on Arduino Cloud, enabling you to log, graph, and analyze sensor data, trigger events and automate processes for industrial, business, or smart home applications via the Portenta H7 board. Take a look at the official documentation to learn more about how to integrate the kit into your IoT projects.

### 4.4 Sample Sketches

Sample sketches for the Portenta Proto Kit ME can be found either in the “Examples” menu in the Arduino IDE or the “Portenta Proto Kit ME Documentation” section of Arduino documentation **[4]**. These examples include basic and advanced applications showcasing motion and environmental monitoring capabilities.

### 4.5 Online Resources

Now that you have gone through the basics of what you can do with the Portenta Proto Kit ME, you can explore the endless possibilities it provides by checking exciting projects on Arduino Project Hub **[5]**, the Arduino Library Reference **[6]** and the ACE-220 online course **[7]**. The Enterprise Prototyping with Portenta Proto Kit ME (ACE-220) course is a FREE resource designed to help you master prototyping in embedded electronics and IoT. Gain hands-on experience with the kit and accelerate your journey from concept to innovation by building functional prototypes tailored for industrial and IoT applications.

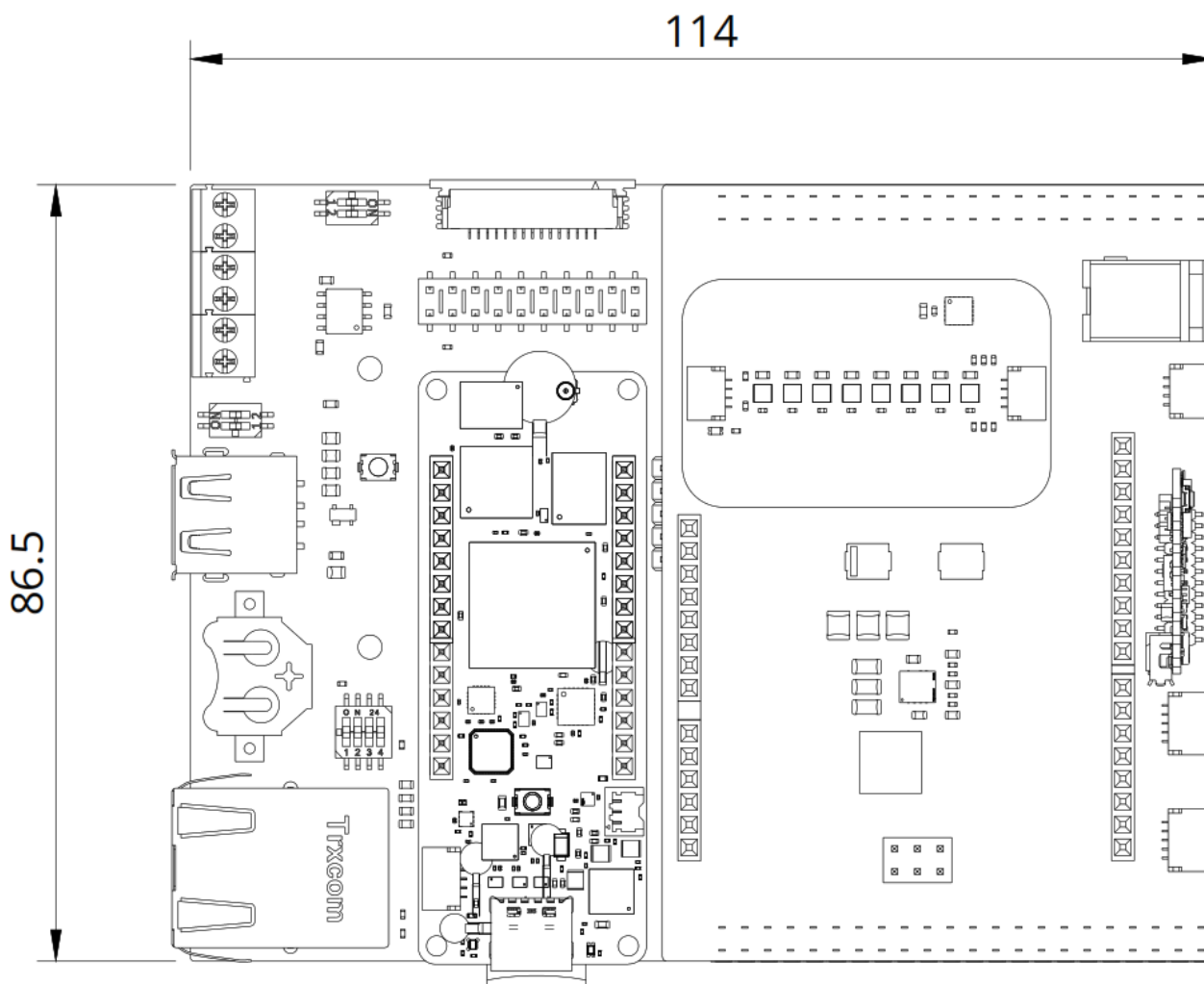
## 5 Mechanical Information

The Arduino Portenta Proto Kit ME offers significant mechanical flexibility, supporting multiple configurations based on the combination of components used. This section provides the main dimensions of one possible configuration for reference. For detailed mechanical specifications of each individual component, please consult the corresponding documentation available on Arduino Docs.

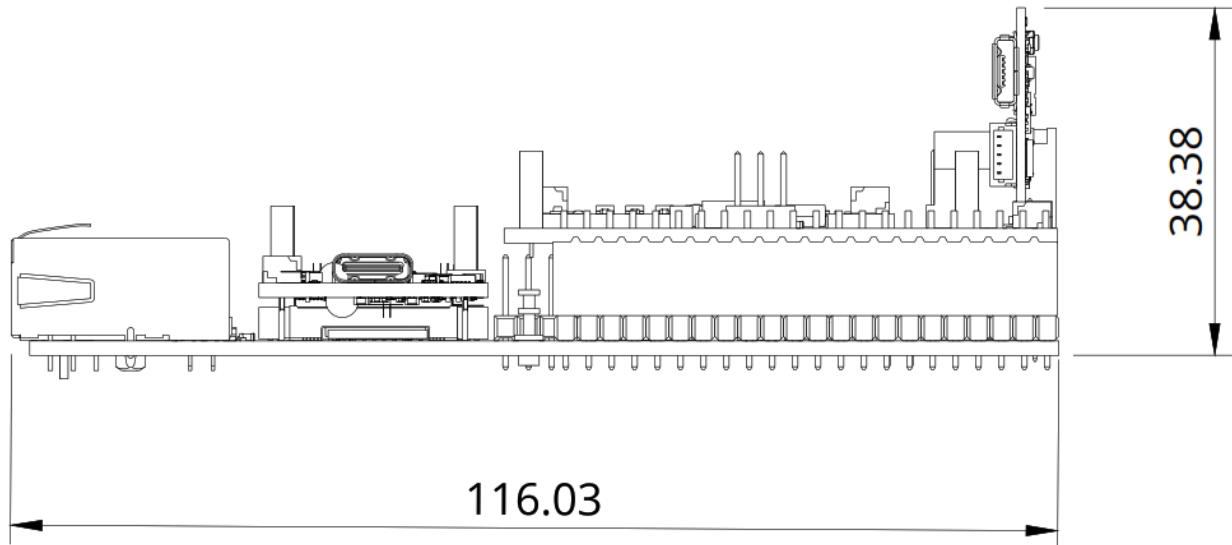
### 5.1 Kit Dimensions

The figures below show the main dimensions of the kit in a stacked configuration that includes the Portenta H7 board, the Portenta Mid Carrier, the Portenta Mid Carrier Proto Shield, the Arduino Pro 4G Module, one Modulino (PIXELS), and the Nicla Sense ME board. All dimensions are in millimeters (mm).

- **Top View:** Displays the width and length of the stacked components configuration of the kit.



- **Side View:** Displays the height of the stacked components configuration of the kit.



## 6 Product Compliance

### 6.1 Product Compliance Summary

Product Compliance
CE (European Union)
RoHS
REACH
WEEE
FCC (USA)
IC (Canada)
UKCA (UK)
Bluetooth®

### 6.2 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

### 6.3 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum Limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl) phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions: No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (<https://echa.europa.eu/web/guest/candidate-list-table>), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

## 6.4 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations concerning laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder, or as a component in metal alloys. As part of our reasonable due diligence, Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

## 7 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

### FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment
3. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### **IC SAR Warning:**

English: This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

French: Lors de l'installation et de l'exploitation de ce dispositif, la distance entre le radiateur et le corps est d'au moins 20 cm.

**Important:** The operating temperature of the EUT can't exceed 85 °C and shouldn't be lower than -40 °C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

## 8 Company Information

Company name	Arduino S.r.l.
Company address	Via Andrea Appiani, 25 - 20900 Mpnza (Italy)

## 9 Reference Documentation

Reference	Link
Arduino IDE (Desktop)	<a href="https://www.arduino.cc/en/Main/Software">https://www.arduino.cc/en/Main/Software</a>
Arduino IDE (Cloud)	<a href="https://create.arduino.cc/editor">https://create.arduino.cc/editor</a>
Arduino Cloud - Getting started	<a href="https://docs.arduino.cc/arduino-cloud/getting-started/iot-cloud-getting-started">https://docs.arduino.cc/arduino-cloud/getting-started/iot-cloud-getting-started</a>
Project Hub	<a href="https://create.arduino.cc/projecthub">https://create.arduino.cc/projecthub</a>
Library Reference	<a href="https://www.arduino.cc/reference/en/">https://www.arduino.cc/reference/en/</a>
Online Store	<a href="https://store.arduino.cc/">https://store.arduino.cc/</a>
ACE-220 Course	<a href="https://academy.arduino.cc/courses/ace-220">https://academy.arduino.cc/courses/ace-220</a>

## 10 Document Revision History

Date	Revision	Changes
10/01/2025	1	First release