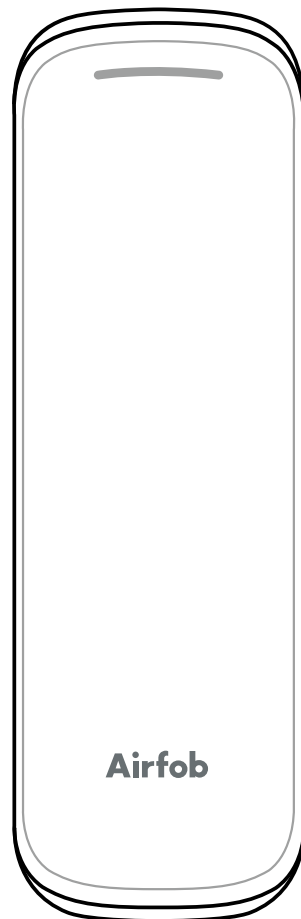


# AE-MU

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## Airfob Edge Reader Ultimate



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# Safety Instructions

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Please read this safety instructions before you use the product to prevent injury to yourself and others and to prevent property damage. The term 'product' in this manual refers to the product and any items provided with the product.

## Instructional icons



**Warning:** This symbol indicates situations that could result in death or severe injury.



**Caution:** This symbol indicates situations that may result in moderate injury or property damage.



**Note:** This symbol indicates notes or additional information.



## Warning

### Installation

**When using a high-capacity power supply, please pay special attention to avoid miswiring.**

- Miswiring may result in serious fire, electric shock, or product damage.

**Do not install or repair the product arbitrarily.**

- This may result in electric shock, fire, or product damage.
- Damages caused by any modifications or failure to follow installation instructions can void your manufacturer's warranty.

**Do not install the product in a place with direct sunlight, moisture, dust, soot, or a gas leak.**

- This may result in electric shock or fire.

**Install the product in a well-ventilated and cool place away from direct sunlight to prevent overheating when installing it outside.**

**Do not place the product inside the sealed enclosure when installing it outside.**

- It increases the internal temperature of the enclosure and this may result in electric shock, fire, or malfunction.

**Do not install the product in a location with heat from an electric heater.**

- This may result in fire due to overheating.

**Install the product in a dry location.**

- Humidity and liquids may result in electric shock or product damage.

**Do not install the product in a location where it will be affected by radio frequencies.**

- This may result in fire or product damage.

### Operation

**Keep the product dry.**

- Humidity and liquids may result in electric shock, fire, or product damage.

**Do not use damaged power supply adapters, plugs, or loose electrical sockets.**

- Unsecured connections may cause electric shock or fire.

**Do not bend or damage the power cord.**

- This may result in electric shock or fire.



## Caution

### Installation

**Please read this manual before installing the product to ensure a safe and correct installation.**

**When wiring the power cable and other cables, make sure to connect them with the power turned off for all devices involved.**

- The product may malfunction.

**Before connecting power to the product, double-check the manual to ensure that the wiring is correct, then connect the power.**

**Do not install the product under direct sunlight or UV light.**

- This may result in product damage, malfunction, discoloration, or deformation.

**Do not install the power supply cable in a location where people pass by.**

- This may result in injury or product damage.

**Do not install the product near magnetic objects, such as a magnet, TV, monitor (especially CRT), or speaker.**

- The product may malfunction.

**Do not seal around the product with silicone, etc. when installing it on the wall.**

- The product may malfunction.

**Keep the minimum distance between products when installing multiple products.**

- The product may be affected by radio frequencies emitted by other products and the product may malfunction.

**The product is powered by Class 2 Power supply with 12 VDC or by UL 62368-1 listed PoE Power Source Equipment (PSE).**

**Use the IEC/EN 62368-1 approved power adapter that supports higher power consumption than the product. It is highly recommended to use the power adapter sold by Suprema.**

- If the right power supply is not used, the product may malfunction.
- Refer to the Power in the product specifications for maximum current consumption specifications.

**Use a separate power supply for the Secure I/O 2, electric lock, and the product.**

- If connecting and using the same power supply, the product may malfunction.

**For PoE, the maximum distance from PSE is 100 meters or 328 feet.**

**Do not connect and use the power supply and Power over Ethernet (PoE) simultaneously.**

- The product may malfunction.

**It is recommended to use the enclosure if the product is installed outside.**

- The product may malfunction if the water-resistant and dust-resistant features are damaged.

**Do not connect to receptacle controlled by a switch.**

### Operation

**Do not drop the product or cause impacts to the product.**

- The product may malfunction.

**Do not disconnect the power supply while upgrading the firmware of the product.**

- The product may malfunction.

**Do not disclose the password to others and change it regularly.**

- This may result in illegal intrusion.

**Do not store your product in very hot or very cold places. It is recommended to use your product at temperatures from -35 °C to 65 °C.**

- The product may malfunction.

**When cleaning the product, mind the following.**

- Wipe the product with a clean and dry towel.
- If you need to sanitize the product, moisten the cloth or the wipe with a proper amount of rubbing alcohol and gently clean all exposed surfaces including fingerprint sensor. Use rubbing alcohol (containing 70% Isopropyl alcohol) and a clean, non-abrasive cloth like lens wipe.
- Do not apply liquid directly to the surface of the product.

**Do not use the product for anything other than its intended use.**

- The product may malfunction.

# Introduction

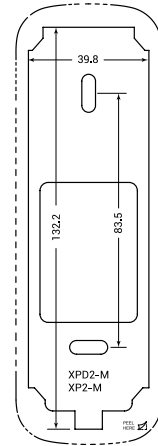
## Components



AE-MU



Wall Bracket



Drilling Template



Wall Fixing Screw x 2



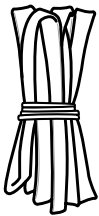
Bracket Fixing Screw  
(Star Shaped)



Diode



120  $\Omega$  resistor



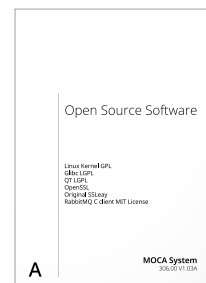
Shrink Tube



PVC Anchor x 2



Quick Guide

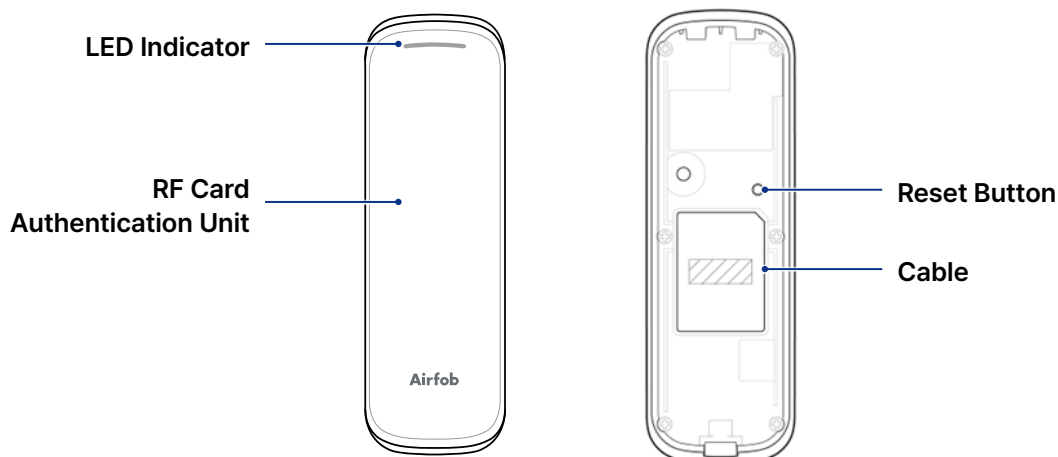


Open Source  
Software Guide

### **Note**

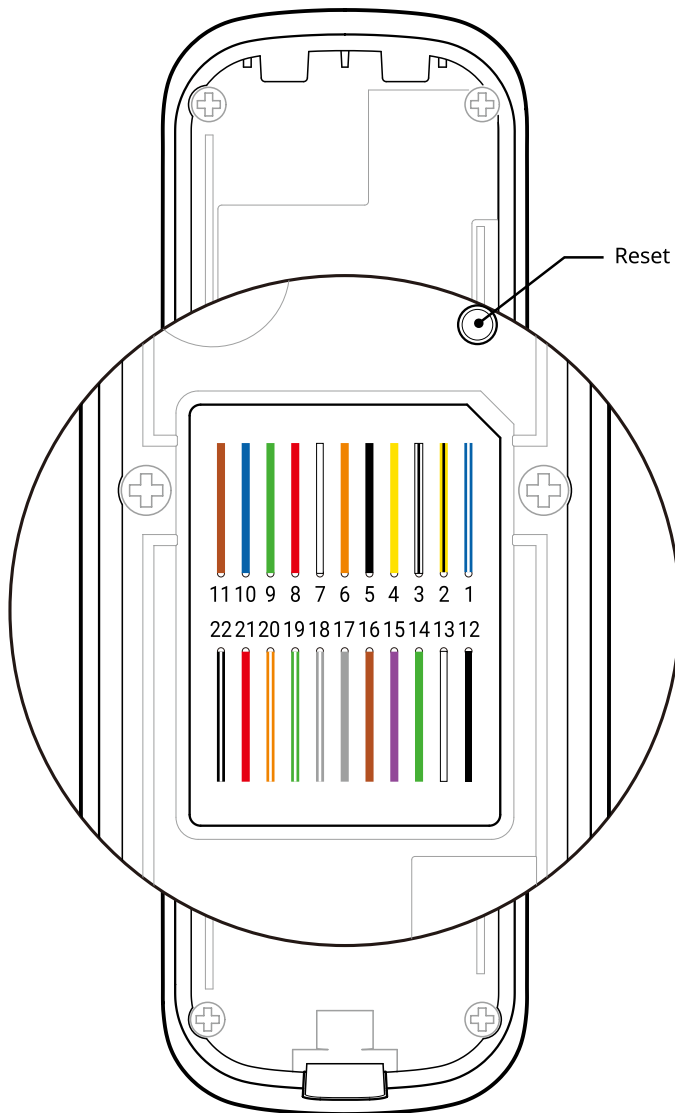
- Components may vary according to the installation environment.

## Name and function of each part



| Name                        | Description   |
|-----------------------------|---|
| LED Indicator               | <p>Indicates the operational status of the device with the color of the LED.</p> <ul style="list-style-type: none"> <li>• Green solid: Authentication success</li> <li>• Red solid: Authentication failure</li> <li>• Blue/Sky blue blinking: Normal operation</li> <li>• Blue/Green blinking: The IP address has not been received properly when using DHCP</li> <li>• Blue/Green blinking: When initializing network settings</li> <li>• Green blinking: Waiting for an input</li> <li>• Green/White blinking: Connecting with the Mobile Credential (BLE) application</li> <li>• White blinking: Connecting with the Device Manager application</li> </ul> |
| RF card authentication unit | Reads RF cards for entering and exiting.  |
| Reset button                | Initialize the device.  |
| Cable                       | <ul style="list-style-type: none"> <li>• Power cable</li> <li>• RS485 cable</li> <li>• Ethernet cable</li> <li>• Wiegand input/output cable</li> <li>• TTL input cable</li> <li>• Relay cable</li> </ul>  |

## Cables and connectors



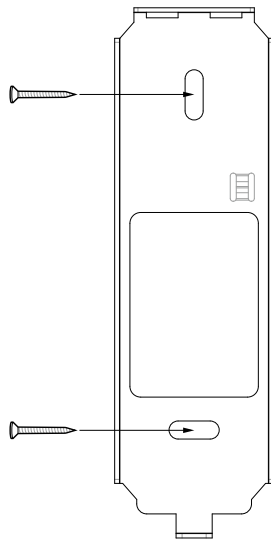
| Pin | Name     | Color                 |
|-----|----------|-----------------------|
| 1   | 485 TRXP | Blue (White stripe)   |
| 2   | 485 TRXN | Yellow (Black stripe) |
| 3   | 485 GND  | White (Black stripe)  |
| 4   | ENET RXN | Yellow                |
| 5   | ENET RXP | Black                 |
| 6   | ENET TXN | Orange                |
| 7   | ENET TXP | White                 |
| 8   | ENET VB1 | Red                   |
| 9   | ENET VB1 | Green                 |
| 10  | ENET VB2 | Blue                  |
| 11  | ENET VB2 | Brown                 |
| 12  | WG GND   | Black                 |
| 13  | WG D1    | White                 |
| 14  | WG D0    | Green                 |
| 15  | TTL IN0  | Purple                |
| 16  | TTL IN1  | Brown                 |
| 17  | TTL GND  | Gray                  |
| 18  | RLY NO   | Gray (White stripe)   |
| 19  | RLY COM  | Green (White stripe)  |
| 20  | RLY NC   | Orange (White stripe) |
| 21  | PWR +VDC | Red                   |
| 22  | PWR GND  | Black (White stripe)  |



# Installation

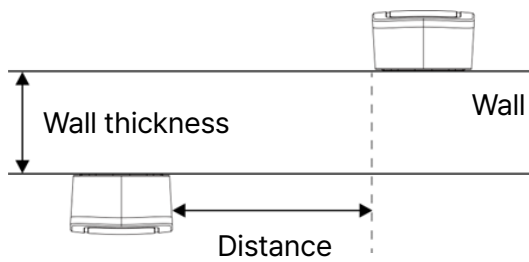
## Fixing the bracket and the product

- 1 Determine the correct position to install the bracket using the provided drilling template. Fix the bracket firmly using fixing screws through the bracket to the position where AE-MU will be installed.

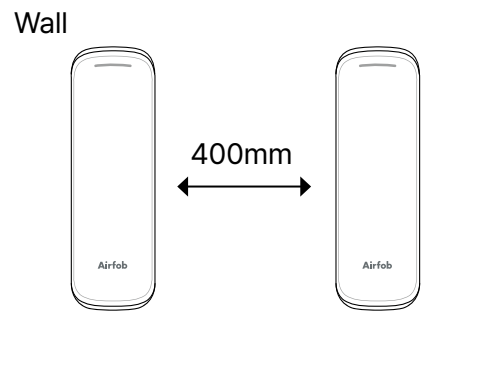


### ⓘ Note

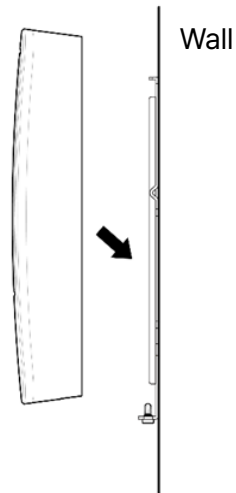
- If installing AE-MU on a concrete wall, drill holes, insert PVC anchors, and fix them with fixing screws.
- To avoid RF interference, a minimum separation distance must be maintained.



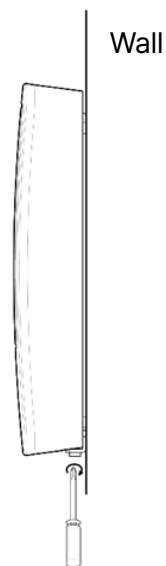
| Wall thickness | Distance |
|----------------|----------|
| 100 mm         | 360 mm   |
| 120 mm         | 360 mm   |
| 150 mm         | 300 mm   |



**2** Install AE-MU onto the fixed bracket.



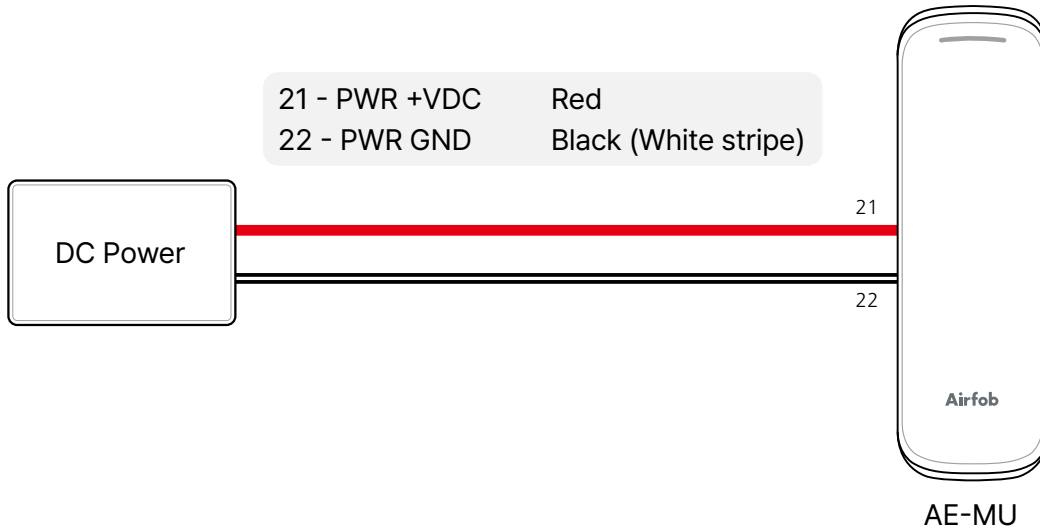
**3** Assemble AE-MU with the bracket by rotating the product fixing screw.



**① Note**

- If installing AE-MU on a concrete wall, drill holes, insert PVC anchors, and fix them with fixing screws.
- To avoid RF interference, a minimum separation distance must be maintained.

## Power supply connection



### ⓘ Note

- Use a power supply adaptor of DC 12V ( $\pm 10\%$ ) with a minimum of 1,000 mA which has obtained the approval of UL 60950-1/UL 62368-1 and UL 294 or equivalent LSS standard that includes supply line transient testing. If you wish to connect and use another device to the power supply adaptor, you should use an adaptor with a current capacity which is the same or larger than the total power consumption required for the terminal and another device.  
– Refer to the Power in the product specifications for maximum current consumption specifications.
- DO NOT extend the length of power cable when using the power adapter.
- Use a separate power supply for Secure I/O 2, the electric lock, and the product respectively. If connecting and using the power supply to these devices together, the devices may malfunction.
- Do not connect to receptacle controlled by a switch.

Make sure to check that distance between the reader and the power supply is within the maximum limits in this table. The actual distance may vary depending on the specifications of your cable and your installation environment.

Minimizing the distance between the power supply and reader will ensure optimal performance. Incorrectly connecting the power supply may cause the reader to malfunction.

| Cable Specification | Maximum extension length<br>(with DC12V) | Cable Resistance<br>( $\Omega$ , per meter) |
|---------------------|--|---|
| 16 AWG              | 200 m                                    | 0.013                                       |
| 18 AWG              | 120 m                                    | 0.021                                       |
| 20 AWG              | 70 m                                     | 0.033                                       |
| 22 AWG              | 50 m                                     | 0.053                                       |
| 24 AWG              | 30 m                                     | 0.084                                       |

\* Distances assume that one device is connected to one power supply.

\* The maximum operating distance may vary depending on the cable manufacturer, due to differences in the resistance.

---

## NEC (National Electrical Code) Compliance

### • PoE Power Supply, Switches and Cables

For setups using Power over Ethernet (PoE) to transmit less than 60 watts of power through a communications cable, the PoE switch or router must follow the guidelines outlined in NEC article 725.121. This is to ensure the power for Class 2 and Class 3 electrical circuits is safely managed.

At minimum, use Category 5e cable for PoE connections to ensure safety. Category 5e meets the bandwidth requirements of Airfob Edge Reader Ultimate but installers may select higher categories of cables based on data transmission speed requirements.

### • Outdoor Equipment Installation

When installing equipment outdoors, use wiring methods, power supplies, and/or PoE switches that meet NEC Class 3 standards. Refer to the instruction manuals for this equipment to ensure that it meets Class 3 standards.

### • Wiring Specifications

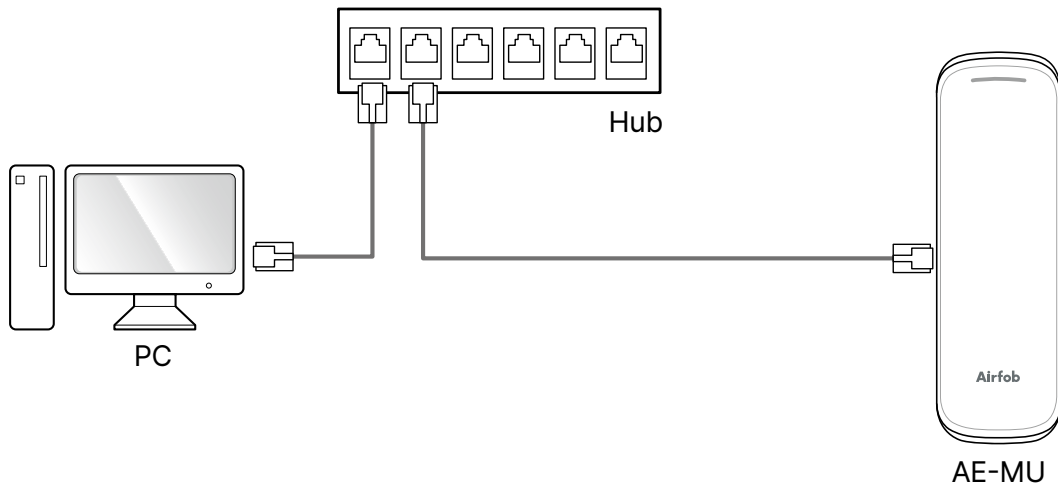
Use a minimum of 26 AWG wire (cross-sectional area of 0.13 square millimeters) when using patch cords to connect power supply equipment such as a PSE or power injector to the Airfob Edge Reader Ultimate (PD).

## Network connection

### • TCP/IP

#### LAN connection (connecting to a hub)

You can connect the product to a hub using a general type CAT-5e cable.

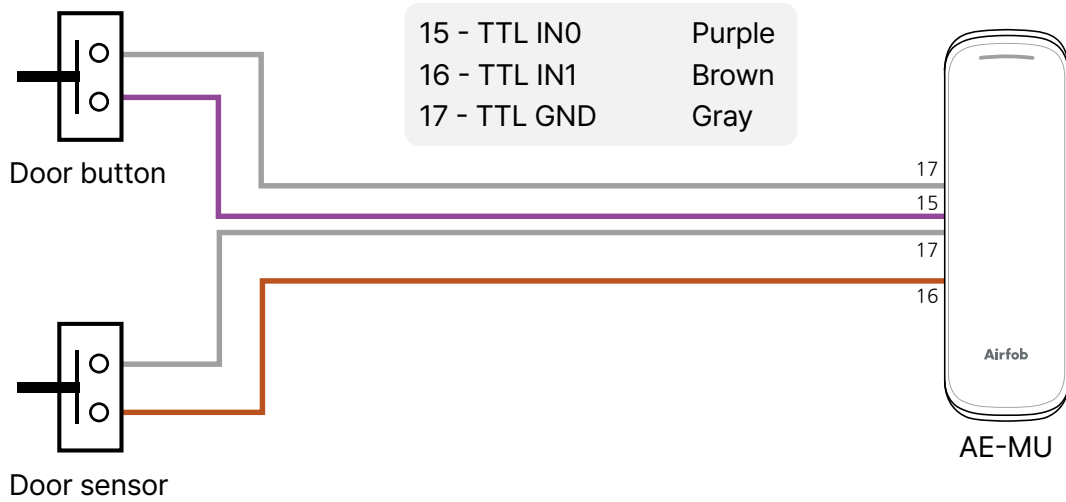


#### LAN connection (connecting to a PC directly)

AE-MU has an automatic MDI/MDIX function so that it can be connected to a PC directly using a normal straight type CAT-5e cable, not a cross cable.



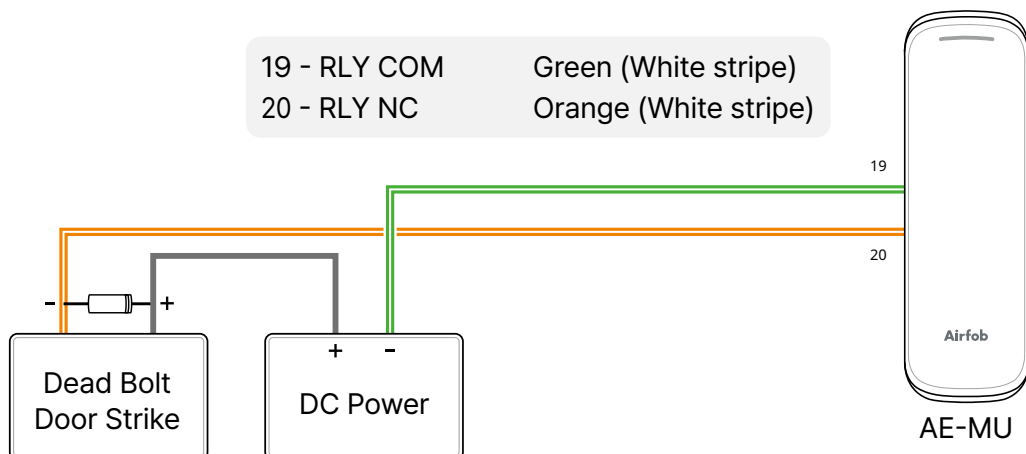
## TTL input connection



## Relay connection

### • Fail Safe Lock

In order to use the Fail Safe Lock, connect N/C relay as shown in the figure below. There is normally a current flowing through the relay for the Fail Safe Lock. When the relay is activated, blocking the current flow, the door will open. If the power supply to the product is cut off due to a power failure or an external factor, the door will open.

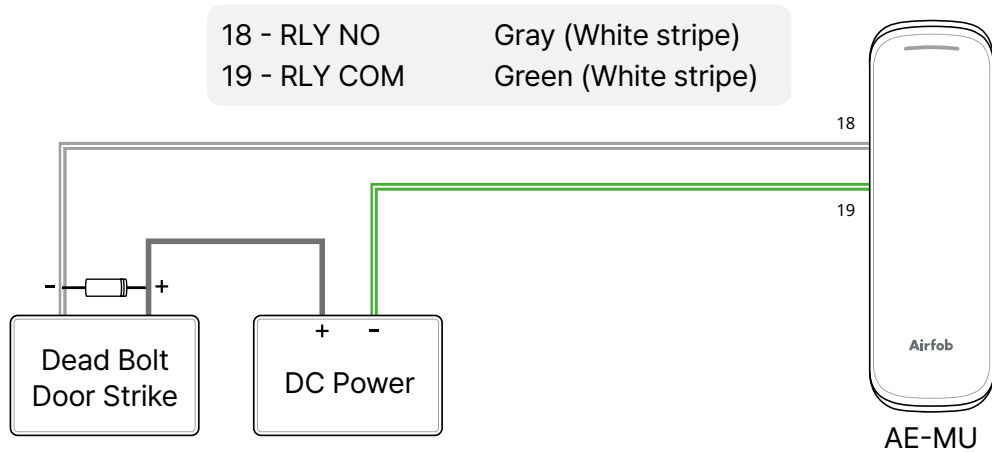


### ⓘ Note

- Install a diode at both sides of the door lock wire as shown in the figure to protect the relay from the reverse current, which occurs when the door lock operates.
- Take caution of the installation direction of the diode. Install the diode close to the door lock.
- Use a separate power supply for AE-MU and the door lock.

**• Fail Secure Lock**

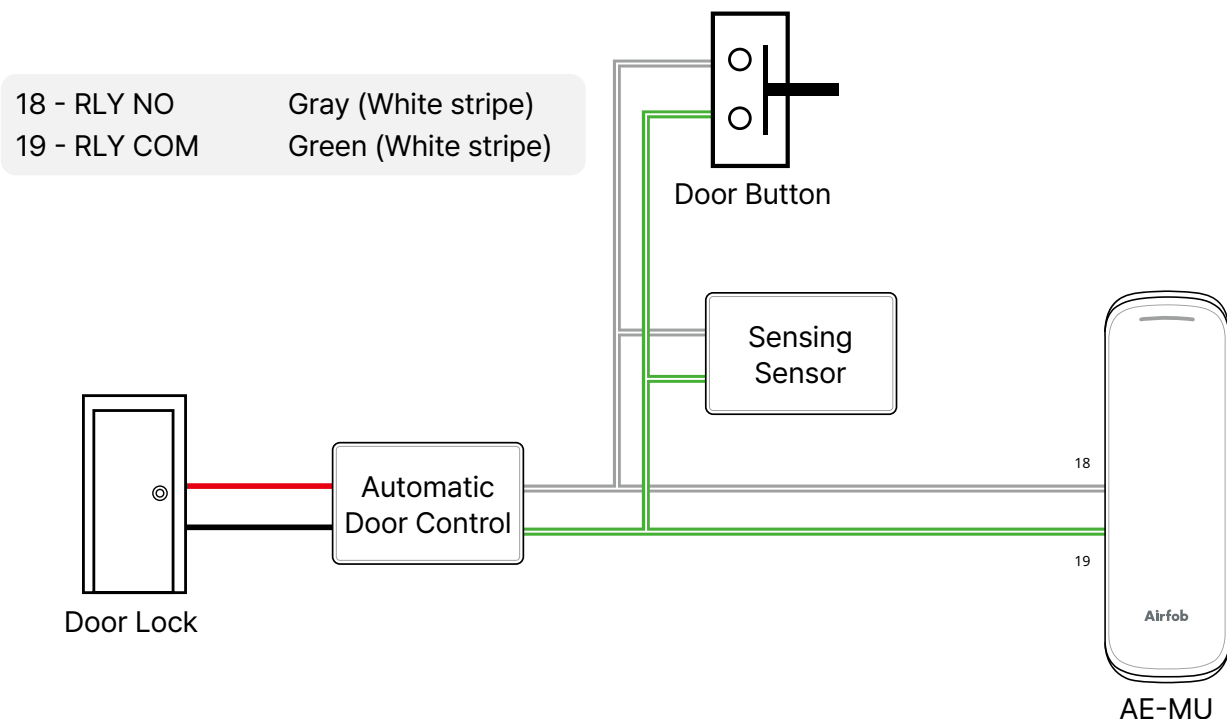
In order to use the Fail Secure Lock, connect N/O relay as shown in the figure below. There is normally no current flowing through the relay for the Fail Secure Lock. When the current flow is activated by the relay, the door will open. If the power supply to the product is cut off due to a power failure or an external factor, the door will lock.



**① Note**

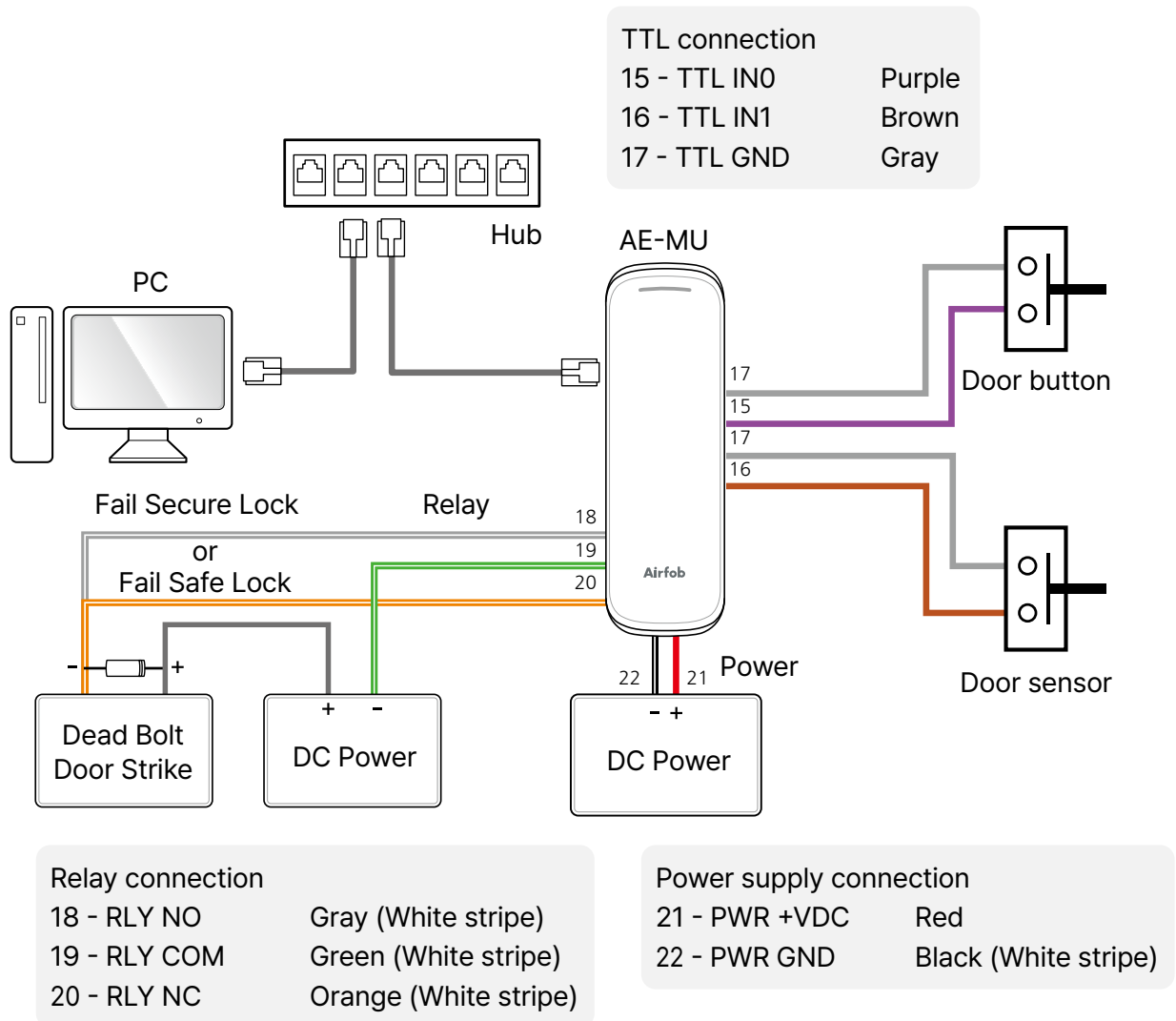
- Install a diode at both sides of the door lock wire as shown in the figure to protect the relay from the reverse current, which occurs when the door lock operates.
- Take caution of the installation direction of the diode. Install the diode close to the door lock.
- Use a separate power supply for AE-MU and the door lock.

**• Automatic door connection**



## Connecting as a standalone

AE-MU can be connected to the door lock, door button, and door sensor directly without connecting a separate I/O device.



### Note

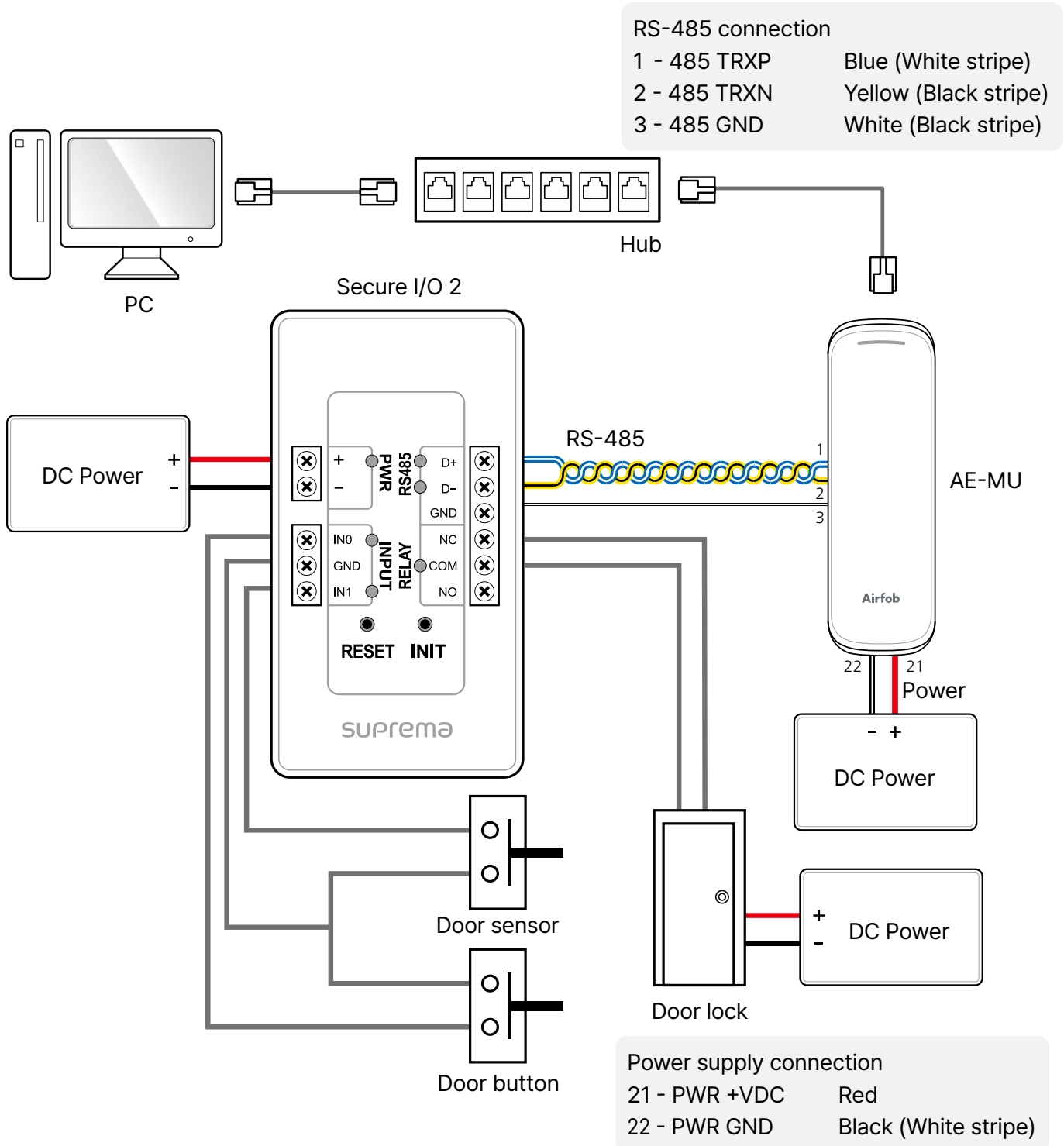
- AE-MU can be used as a multi-door controller with the slave devices with the RS485 cable. The slave devices are used as dummy readers and authentication is performed in the master device.
- If AE-MU is connected as the master device, only card authentication is available on the slave device.
- Up to 31 slave devices can be connected.
- For more information, contact the MOCA System technical support team ([mocainc.zendesk.com](mailto:mocainc.zendesk.com)).



• **Connecting to Secure I/O 2**

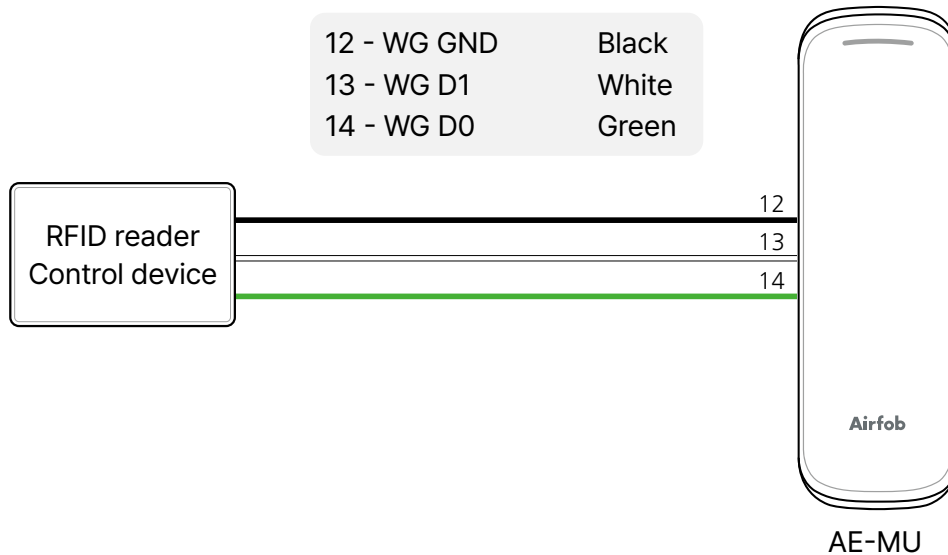
Secure I/O 2 is an I/O device, can be connected to AE-MU with the RS-485 cable. Security can be maintained even if the connection between AE-MU and Secure I/O 2 has been lost or the power supply to AE-MU has been shut off due to external factors.

- Use the RS-485 cable with AWG24, twisted pair, and less than 1.2 km in length.
- If connecting with a RS-485 daisy chain, connect the termination resistor (120 Ω) to both ends of the daisy chain connection. If connected to the middle line, the signal level becomes smaller and the communication performance will deteriorate. Make sure to connect it to both ends of the daisy chain connection.



## • Wiegand connection

Use as a Wiegand input/output device.



## • Resetting Network Settings

1. Turn the power on.
2. Press and hold the reset button on the rear of device until the device restart automatically.
3. Connect the device with default values.
  - TCP/IP address: DHCP address assignment (If DHCP address assignment is failed, 169.254.x.x will be set.)
  - Server mode: Disabled
  - RS-485: Default, 115200 bps
4. Change the TCP/IP address or RS-485 information.
5. Turn the power off later on and then check the network setting is properly.

## • Restoring the Factory Defaults

This will delete all data and root certificate on the device and reset the settings.

1. Turn the power on.
2. Press the reset button three times quickly.
3. When the green LED is blinking, press the reset button again.

### ⓘ Note

- If there is no root certificate on the device, you cannot restore the factory defaults.

# Reader Registration & Configuration

---

## • Reader Registration

When administrators install a new Airfob Edge Reader Ultimate (AE-MU), they need to register and set it up using the Airfob Pro application available for iOS and Android devices. To download the app, search for "Airfob Pro" in the Apple App Store (for iOS devices) or the Google Play Store (for Android devices).

---

### ⓘ Note

When registering a reader, it **MUST** be connected to an Ethernet cable with an active internet connection. This connection is necessary for the reader to receive the site certificate. After successfully registering a reader, it does not need to maintain an internet connection to work with Airfob Space mobile credentials. However, an internet connection is required to use RFID cards.

1. Open the Airfob Pro application on a compatible iOS or Android device.
2. Log in as an administrator for the site where the reader is being installed.
3. Select "Access Point" from the tab bar at the bottom of the app, then navigate to "Device" > "All Devices." This will display a list of devices already registered on the site.
4. Tap the "+" button in the upper right corner of the app. This will present a list of all Airfob-compatible devices within the phone's range.
5. A "Register" button will appear next to unregistered devices that are powered on and connected to a network. Tap the register button next to the device you wish to add.
6. The device will automatically reboot and play a success chime once it has been registered to the site.

## • Reader Setup

Administrators can modify a reader's settings using the Airfob Pro iOS or Android application, or the Airfob Pro web portal available at <https://app.airfobspace.com>.

---

### ⓘ Note

When updating certain settings, the reader **MUST** be connected to an Ethernet cable with an active internet connection.

To change device settings, navigate to the "Devices" screen in the Airfob Pro iOS or Android application, or the Airfob Pro web portal. Tap or click the icon for the device you wish to update. Administrators can change settings, including the device nickname, time zone, network address, and more.

Administrators can also check the device firmware version on this screen in the "Firmware Version" field, which displays the current firmware version and its release date. To update the firmware, click or tap the "Firmware Update" button and select the desired firmware version from the menu.

# Product specifications

| Category   | Feature               | Specification  |
|------------|-----------------------|--|
|            |                       | AE-MU  |
| Credential | LF card option        | EM   |
|            | HF card option        | MIFARE, MIFARE Plus, DESFire EV1/EV2*, FeliCa                    |
|            | NFC card              | Supported  |
|            | BLE card              | Supported  |
|            | RF read range         | MIFARE/DESFire/EM : 50 mm, FeliCa: 30 mm                         |
| General    | CPU                   | 1 GHz  |
|            | Memory                | 4 GB Flash + 64 MB RAM   |
|            | LED                   | Multi-color  |
|            | Sound                 | Multi-tone Buzzer  |
|            | Operating temperature | -35 °C - 65 °C   |
|            | Storage temperature   | -40 °C - 70 °C   |
|            | Operating humidity    | 0% - 95 %, non-condensing  |
|            | Storage humidity      | 0% - 95 %, non-condensing  |
|            | Dimension (W x H x D) | 48 mm x 145 mm x 27 mm   |
|            | Weight                | Device: 141 g<br>Bracket: 30 g (Including washer and bolt)       |
|            | IP rating             | IP65, IP67   |
|            | IK rating             | IK08   |
|            | Certificates          | CE, FCC, KC, RoHS, REACH, WEEE, SIG, TELEC, ETL Listed to UL 294 |
| Capacity   | Max. User             | 200,000  |
|            | Max. Card             | 200,000  |
|            | Max. Text Log         | 1,000,000  |
| Interface  | Wi-Fi                 | Not supported  |
|            | Ethernet              | Supported (10/100 Mbps, auto MDI/MDI-X)                          |
|            | RS-485                | 1ch Master or Slave (Selectable)                                 |
|            | Wiegand               | 1ch Input or Output (Selectable)                                 |
|            | TTL input             | 2ch Input  |
|            | Relay                 | 1 Relay  |
|            | PoE                   | Supported (IEEE 802.3af compliant)                               |
|            | Tamper                | Supported  |

| Category                     | Feature                           | Specification  |
|------------------------------|-----------------------------------|--|
|                              |                                   | AE-MU  |
| Electrical                   | Power                             | Voltage: DC 12 V, Current: Max. 500 mA<br>* Use 12 VDC, 1 A power supply |
|                              | Switch input V <sub>IH</sub>      | Min. 3 V / Max. 5 V  |
|                              | Switch input V <sub>IL</sub>      | Max. 1 V   |
|                              | Switch Pull-up resistance         | 4.7k $\Omega$ (The input ports are pulled up with 4.7k $\Omega$ .)       |
|                              | Wiegand output V <sub>OH</sub>    | Min. 4.8 V   |
|                              | Wiegand output V <sub>OL</sub>    | Max. 0.2 V   |
|                              | Wiegand output Pull-up resistance | Internally pulled up with 1 k $\Omega$                                   |
|                              | Relay                             | Voltage: Max. 30 VDC<br>Current: Max. 2 A                                |
| UL-294 Access Control Levels | Destructive Attack                | Level I  |
|                              | Line Security                     | Level I  |
|                              | Endurance                         | Level IV   |
|                              | Standby Power                     | Level I  |

\* RF read range will vary depending on the installation environment.

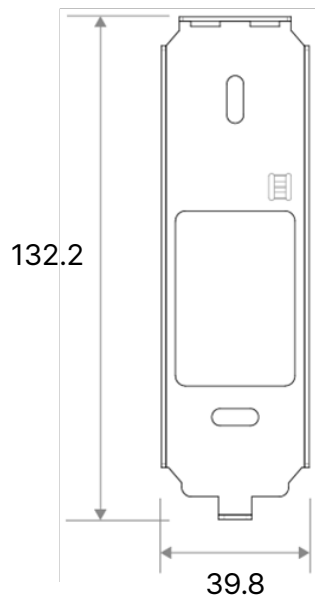
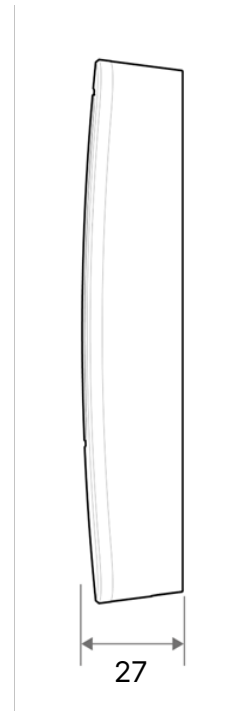
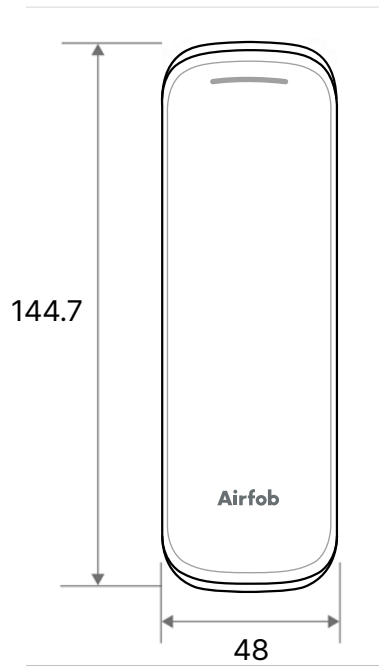
\* DESFire EV2 cards are supported by having backward compatibility of DESFire EV1 cards. CSN and smart card functions are compatible with AE-MU.

# Dimensions

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(Unit: mm)

\* The tolerance is  $\pm 0.3\text{mm}$ .



# FCC compliance information

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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, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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## **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.
- Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

# EU Declaration of Conformity (CE)

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- Bluetooth Transmit Power: 2.1dBm
- Bluetooth Frequency: 2402~2480 MHz
- NFC Frequency: 13.56 MHz
- RFID Frequency: 13.56 MHz + 125 kHz

For more information, contact us at the following contact information.

MOCA System Inc.

Website: <https://www.airfob.com>

Address: Room 1702 KINS Tower, 331beon-gil, 8 Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, 13558, Rep. of KOREA

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