

# **SYGOLE**

## **SG-HR-I5 Technical Manual**

**V1.0.0**



The purpose of the manual is to provide the complete hardware appearance parameter, electrical parameter, necessary schematic circuit diagram of the SG-HR-I5 high frequency reader. If necessary, the reader hardware may be correspondingly modified according to the information provided in the manual in order to adapt to the application conditions of different industrial fields.

The manual mainly includes the following contents:

- Functional description of the reader
- Reader interface definition, mechanical and electrical parameter
- Cable cord set pin definition, mechanical and electrical parameter

If you have any unclear information in the manual or any inconsistency with practical situations, please contact with us.

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## ***Specification for Marks in the Manual***

### **Caution Sign**



If there is a “Caution Mark” in the manual, it indicates that the user needs to pay attention during use. If the user fails to follow or ignores such information during use, the equipment may be directly or indirectly caused to have abnormal operation. Please be careful to read the content with such mark.

### Manual Version Information

| Version | Date       | Revision Reason | Reviser |
|---------|------------|-----------------|---------|
| V1.0.0  | 2025.06.25 | First release   | CZW     |
|         |            |                 |         |

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## 1. Brief Introduction

### 1.1 Brief introduction to the reader

Sygole SG-HR-15 reader is an integrated high frequency RFID read-write device. It operates at 13.56 MHz which complies with the ISO15693 standard, and supports RS-485, RS-232, or POE communication. The shell is made of high strength engineering plastics. The reader has the advantages of reliable identification and convenient installation in a narrow position.

#### Tag operation

SG-HR-15 supports all mandatory functions defined by ISO15693 protocol and some optional functions, and can operate ISO15693 protocol electronic tags.

#### Reader command system

In addition to the automatic card reading function, the reader, as a perceptual product, can also realize other logic functions. There are two types of commands which are shown in the **Table 1**.

**Table 1. Reader Command Type**

| Type                   | Function                                                                                                          |
|------------------------|-------------------------------------------------------------------------------------------------------------------|
| Control Command        | Perform a single reader operation. For example, read tags once, write tags once, and configure reader parameters. |
| Service Switch Command | Turn on or off the service. Such as enabling automatic periodic tag reading services.                             |

#### The main features of this reader are as follows:

- IP67 protection rating and excellent immunity design, can adapt to harsh working conditions.
- Efficient data collection capability, can effectively improve the accuracy of MES system data acquisition.

## 1.2 Overview of control command functions

The control command is executed at one time. After receiving the control command, the reader will return a message to confirm the execution of the command regardless of the execution result. Control commands and return messages are shown in the **Table 2**:

**Table 2. Overview of control command functions**

| Command                         | Function                                                                              |
|---------------------------------|---------------------------------------------------------------------------------------|
| Get Inventory                   | Read the UID of the tag in the antenna field range                                    |
| Read By Byte                    | Read tag memory by byte. Need to configure the starting address and number of bytes.  |
| Write By Byte                   | Write tag memory by byte. Need to configure the starting address and number of bytes. |
| Erase Tag Memory                | Erase the specified size of memory of the tag to the same value.                      |
| Set User Configuration          | Set the user configuration of the reader, which can be saved after power failure.     |
| Get User Configuration          | Get the user configuration of the reader.                                             |
| Set User Extended Configuration | Configure automatic card reading function, tag cache, etc.                            |

**Table 3. Overview of the type of message returned by the control command**

| Message              | Reason                                                    |
|----------------------|-----------------------------------------------------------|
| Execution Successful | Command execution successful.                             |
| Execution Failure    | Command execution failed.                                 |
| No Tag               | There is no tag near the reader.                          |
| Check Error          | Error codes occur in command packets during transmission. |
| Parameter Error      | The parameters carried by the command are invalid.        |

\*For a detailed description of packet structure and function, refer to the *High Frequency Reader Development Manual*.

## 1.3 Working mode of the reader

In addition to executing the control commands sent by the host computer, in order to reduce the burden on the host system (periodically sending control commands), the reader can be enabled to automatically read in some cases: for example, automatically read tags regularly.

**It should be noted that** the auto-read mode does not support a reply acknowledgement mechanism. That is, when the reader sends a message, no matter whether the upper computer system correctly receives the message packet, the upper computer does not need to make a response to confirm. The advantage of this design is to reduce the burden of the reader and the host computer system, but at the same time, we should pay attention to the harm that may occur to the system when the host computer fails to correctly accept the message packet.

**Table 4. Overview of working mode and functions**

| Mode             | Function                                                                                                                                                                                                                                                                                                                   |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto-Read Mode   | When the tag enters the read/write range of the reader, the reader automatically reads the user-specified data (tag UID or byte data) and determines whether to upload the tag to the host according to the configuration information. This working mode can simultaneously receive and process interactive mode commands. |
| Interactive mode | The reader does not perform any automatic reading operation. When the host sends commands to the reader, the reader works according to the commands.                                                                                                                                                                       |

\*For a detailed description of packet structure and function, refer to the *High Frequency Reader Development Manual*.

## 2. Hardware usage instruction

The SG-HR-I5 high frequency reader has an external interface that provides both power and communication. There are two indicators, namely the power/communication indicator and tag/fault indicator. The following text provides a detailed definition and specification of them.



### 2.1 Communication interface

SG-HR-I5 supports RS485, RS232 and POE, the specific definition of the interface is as follows:

**Table 5. RS485 interface (M12 A-coding 5 pin plug) pin definition (order type: SG-HR-I5-RS485)**

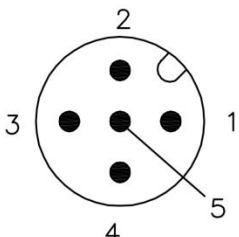
| Serial Number | Definition | Pre-cast Cable Color                                                                      | Schematic drawing                                                                     |
|---------------|------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1             | 24V        | Brown  |  |
| 2             | RS485_A    | White  |                                                                                       |
| 3             | 0V         | Blue   |                                                                                       |
| 4             | RS485_B    | Black  |                                                                                       |
| 5             | PE         | Shielding layer                                                                           |                                                                                       |

**Table 6. RS232 interface (M12 A-coding 8 pin plug) pin definition (order type: SG-HR-I5-RS232)**

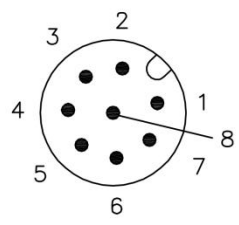
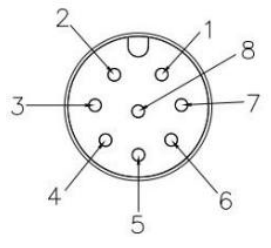
| Serial Number | Definition | Pre-cast Cable Color                                                                     | Schematic drawing                                                                   |
|---------------|------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1             | 24V        | Brown   |  |
| 2             | RS232_TX   | White   |                                                                                     |
| 3             | 0V         | Blue    |                                                                                     |
|               | RS232_GND  | Yellow  |                                                                                     |
| 4             | RS232_RX   | Pink    |                                                                                     |
| 5             | PE         | Gray    |                                                                                     |
| 6             | NC         |                                                                                          |                                                                                     |
| 7             | NC         |                                                                                          |                                                                                     |
| 8             | NC         |                                                                                          |                                                                                     |

**Table 7. POE interface (M12 A-coding 8 pin plug) pin definition (order type: SG-HR-I5-POE)**

| Serial Number | Definition | Pre-cast Cable Color                                                                                                         | Schematic drawing                                                                     |
|---------------|------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1             | TD+        | Generally, POE communication cables are used directly to power and communicate with POE switches, without using loose cables |  |
| 2             | TD-        |                                                                                                                              |                                                                                       |
| 3             | RD+        |                                                                                                                              |                                                                                       |
| 4             | RD-        |                                                                                                                              |                                                                                       |
| 5             | PoE-       |                                                                                                                              |                                                                                       |
| 6             | PoE-       |                                                                                                                              |                                                                                       |
| 7             | PoE+       |                                                                                                                              |                                                                                       |
| 8             | PoE+       |                                                                                                                              |                                                                                       |

## 2.2 Switch and indicator status

SG-HR-I5 provides one LED indicator, which are defined as follows:

**Table 8. Reader indicator description**

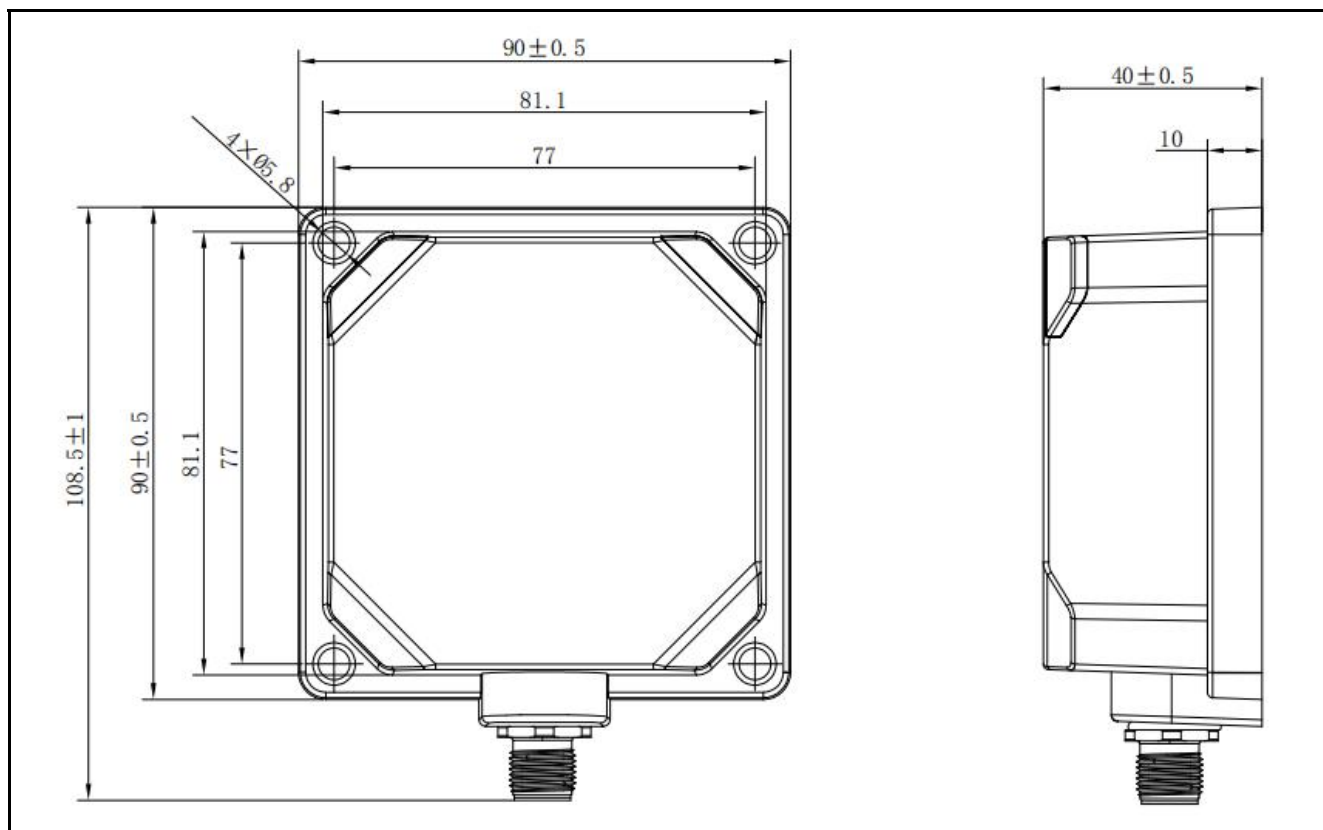
| <b>Indicator Name</b>         | <b>Function</b>                                                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power/Communication Indicator | <b>Off:</b> No power on.<br><b>Steady blue:</b> The power supply is normal.<br><b>Blinking blue:</b> Data is being transferred.                                                                                                                                                |
| Tag/Fault Indicator           | <b>Off:</b> No tag is in the read area or the tag read operation is not performed.<br><b>Steady blue:</b> There is a tag in the read field, and the tag is continuously recognized.<br><b>Blinking blue:</b> The tag operation succeed.<br><b>Steady red:</b> Exception error. |

### 3. Shell parameters

#### 3.1 Shell Physical parameter

Table 9. Physical parameter of I5-RS485/I5-RS232

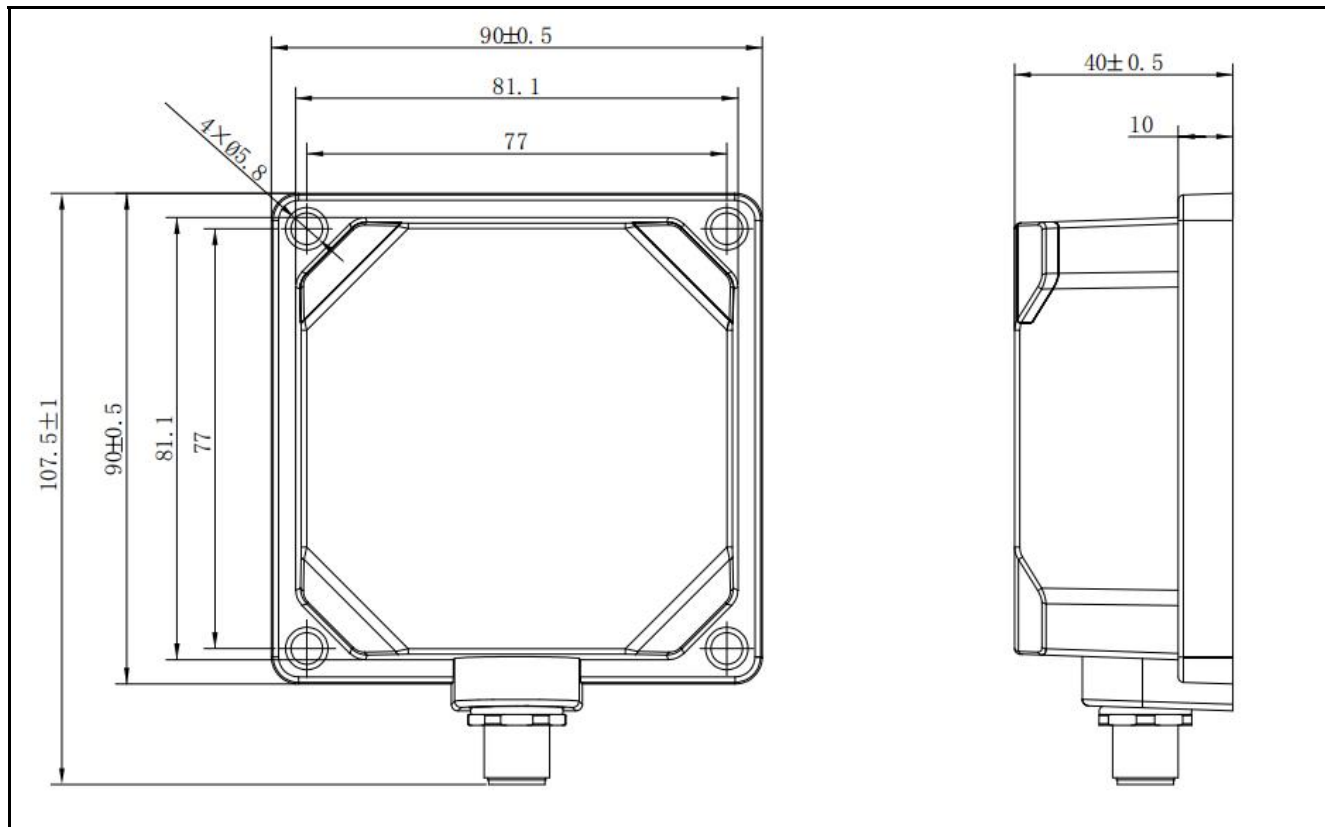
| Name                   | Parameter              |
|------------------------|------------------------|
| Boundary dimension     | 90×108.5×40 mm (±1 mm) |
| Mechanical weight      | 0.32 KG (±5%)          |
| Housing material       | PC + ABS               |
| Housing material color | Black                  |



(Unit in millimeter)

**Table 10. Physical parameter of I5-POE**

| Name                   | Parameter              |
|------------------------|------------------------|
| Boundary dimension     | 90×107.5×40 mm (±1 mm) |
| Mechanical weight      | 0.32 KG (±5%)          |
| Housing material       | PC + ABS               |
| Housing material color | Black                  |



(Unit in millimeter)

## 4. Electrical parameter

### 4.1 Power source

**Table 11. Reader power electrical parameters of I5-RS485/I5-RS232**

|                 |                          |
|-----------------|--------------------------|
| Supply voltage  | 24 V DC ( $\pm 20\%$ )   |
| Average current | Less than 0.05 A@24 V DC |

**Table 12. Reader power electrical parameters of I5-POE**

|                 |                          |
|-----------------|--------------------------|
| Supply voltage  | 48V                      |
| Average current | Less than 0.05 A@48 V DC |

## 5. Performance parameter

### 5.1 Working environment

Table 13. Reader working environment parameters

|                                |                                                   |
|--------------------------------|---------------------------------------------------|
| Operating temperature          | -25 °C ~+ 70 °C                                   |
| Storage temperature            | -40 °C ~+ 85 °C                                   |
| Relative humidity              | 5%~95% RH (non condensing)                        |
| Ingress protection             | IP67                                              |
| Drop test standard             | GB/T 2423.7-2018 (In the packaged state, 3m fall) |
| Anti vibration test standard   | GB/T 2423.10-2019/IEC 60068 -2 -6:2007            |
| Surge protection test standard | GB/T 17626.5-2019, 2KV                            |
| Certification                  | CE                                                |

### 5.2 Communication interface

Table 14. Reader communication parameters

|                        |                                               |
|------------------------|-----------------------------------------------|
| Physical Interface     | RS-485/RS-232/POE                             |
| Communication rate     | 9600~115200 bps or 10/100 M Ethernet          |
| Communication protocol | Modbus-RTU/Modbus-TCP/Sygole private protocol |

### 5.3 Supported Protocols

Table 15. Supported Protocols

|                   |          |
|-------------------|----------|
| Wireless protocol | ISO15693 |
|-------------------|----------|

### 5.4 Operating frequency

Table 16. Reader wireless operating frequency

|           |           |
|-----------|-----------|
| Frequency | 13.56 MHz |
|-----------|-----------|

### 5.5 Read-write distance

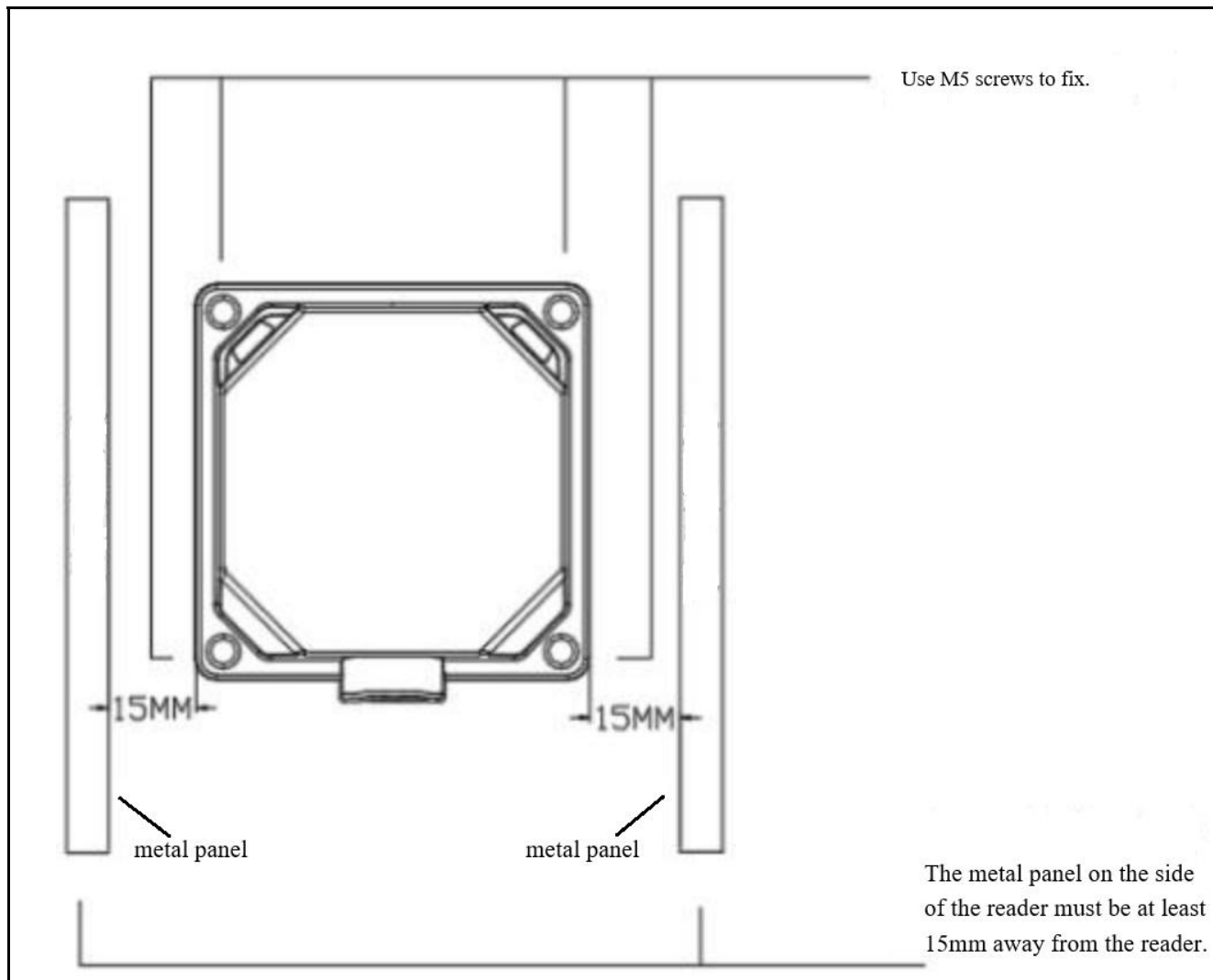
Table 17. Reader read-write distance parameter

|                     |                            |
|---------------------|----------------------------|
| Read-Write distance | 0~150 mm (Related to tags) |
|---------------------|----------------------------|

## 6. Reader installation

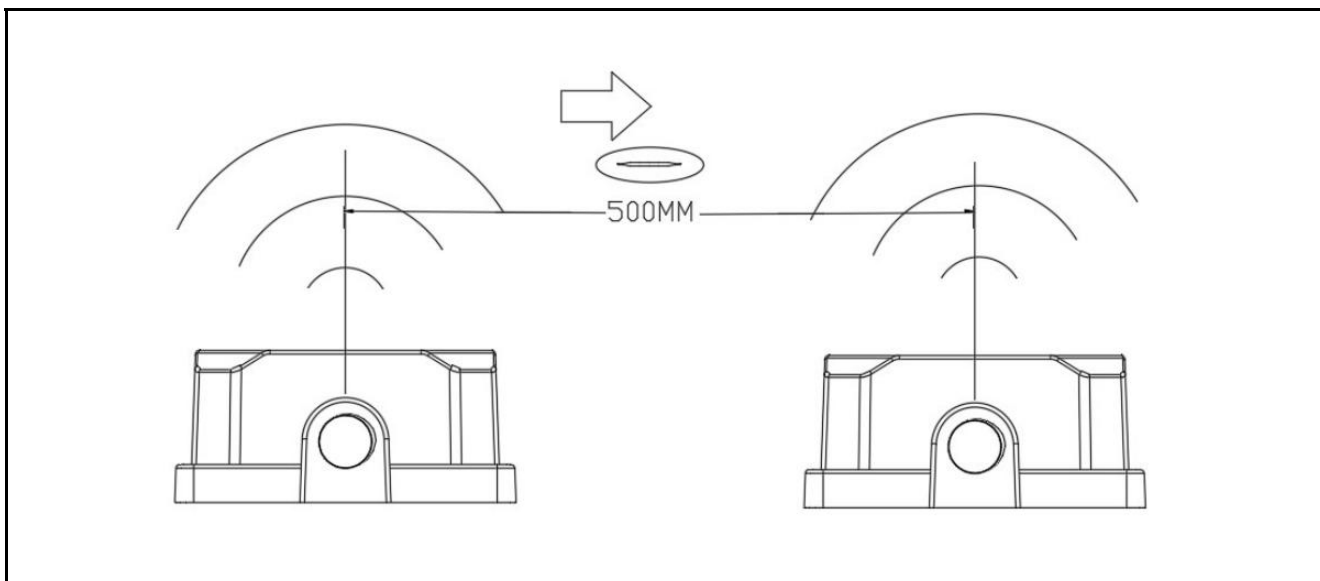
### 6.1 Fixation

The product comes with 4 M5 holes, which should be mounted directly with 4 M5 screws.



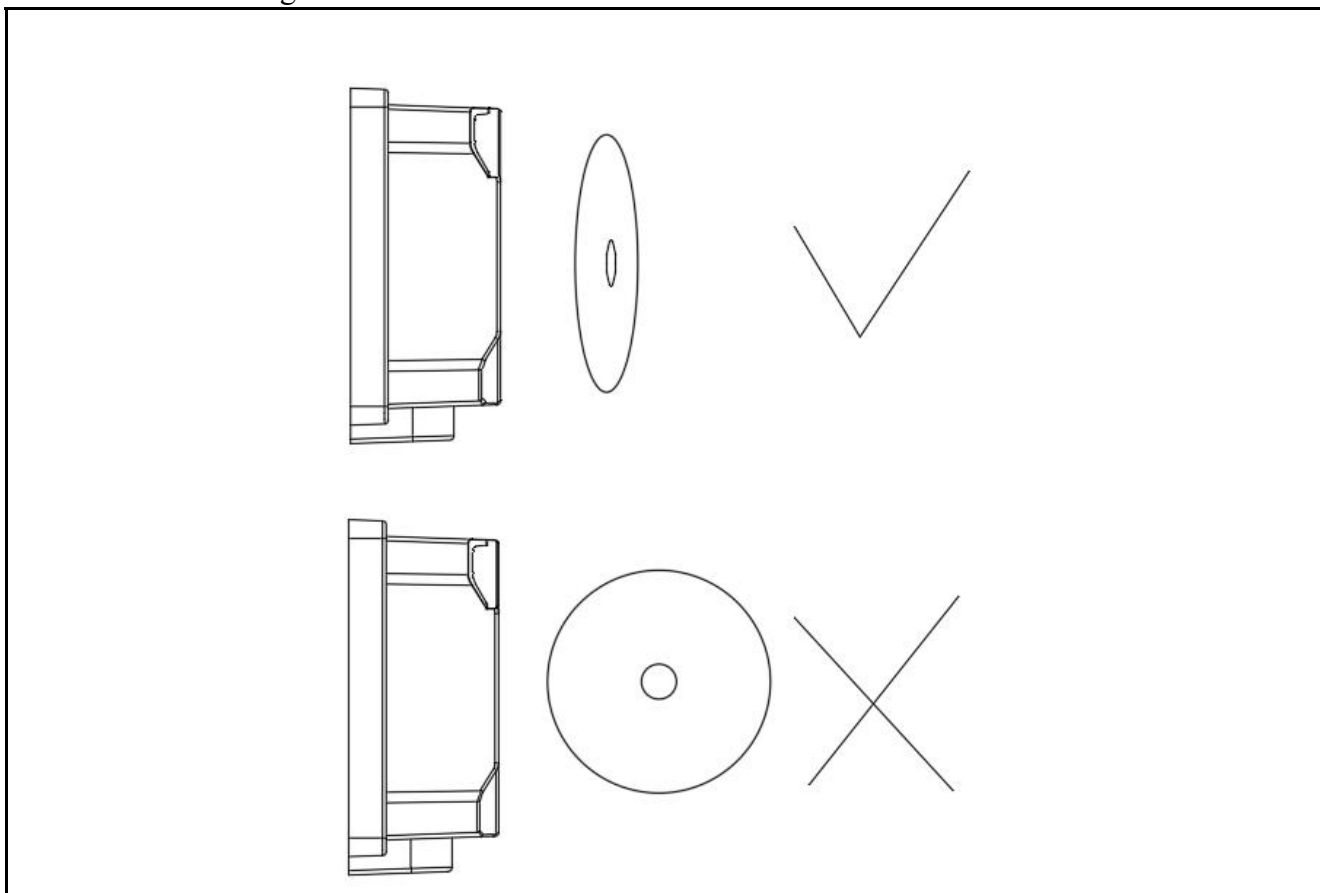
## 6.2 Installation spacing

When there are multiple RFID readers to be installed, the distance between the readers needs to be more than 500 mm.



## 6.3 Tag installation

When installing tags, please ensure the induction plane of the RFID reader parallel to the plane on the front of the tag.



## 7. Safety information

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.

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

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.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum 20cm distance between the radiator and your body: Use only the supplied antenna.

IC Caution:

- English:

This device complies with Innovation, Science and Economic Development Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

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

To maintain compliance with RSS-102 RF Exposure guidelines, This equipment should be installed and operated with minimum 20cm distance between the radiator and your body: Use only the supplied antenna.

- French:

Cet appareil est conforme aux normes RSS exemptées de licence d'innovation, sciences et développement économique Canada.

L'exploitation est autorisée aux deux conditions suivantes:

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

Pour être conforme aux lignes directrices d'exposition RF RSS-102, cet équipement doit être installé et exploité à une distance minimale de 20cm entre le radiateur et votre corps: n'utilisez que l'antenne fournie.