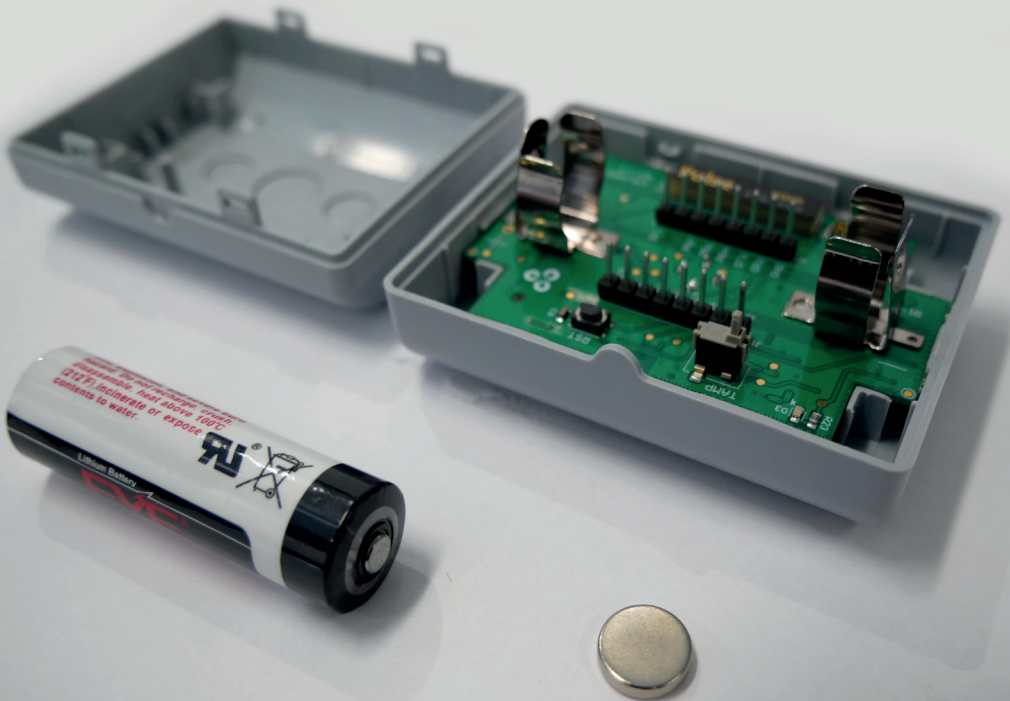




Safer Door SYSTEM

Installation and User Guide



Summary

This document serves as the Installation and User Guide for the LoRaWAN Safer Door System which has been developed by CENSIS Technology Solutions.

Technical support: information@censis.tech

Revision History

Rev. No.	Date	Description of Change
DRAFT	20-Apr-2023	Draft Release
1.0	05-May-2023	Updated to address feedback from the approvals/certification electrical safety test review. Namely: Approvals and Declaration of Conformity sections updated with revised safety standard information. Device Installation and Operation Guide section updated to expand the double-sided tape and screw mounting options. Product Label Drawing section updated with the device marking/label drawing.
1.1	09-May-2023	Terms and descriptions updated following peer review.
1.2	22-Jun-2023	Section 3 updated with final approvals test report and certificate numbers.
1.3	13-Dec-2023	Sections 1.2, 1.8 and 3 updated with Fire Resistance test information.

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1 | SAFER DOOR SYSTEM

1.1 | Description

The door sensor is a battery powered, LoRaWAN device, designed for indoor use.

In conjunction with a small external magnet, the primary functions of the device are:

- To monitor the state of a door, relative to the closed position, and transmit an alert message when the door is in the "open" or "ajar" state for a given time.
- To track and report how often the door has been opened/closed.
- To report ambient temperature/humidity.
- To report battery health.



1.2 | Technical Specification Chart

Frequency	868MHz
RF Power	14dBm EIRP
Modulation	LoRaWAN™
Network Protocol	LoRaWAN v1.0.3
RX sensitivity	-148dBm, at 10.4kHz, SF12
Battery	3.6V lithium-thionyl chloride (LiSOCl ₂)
Operating temperature range	-10°C < T < +55°C
Antenna	868MHz, ISM, chip
Power supply	Min 3V / Max 3.6V
Consumption in standby mode	30µA (typ)
Dimension	66 x 52 x 27mm
Reference standards	EMC, EN 301 489-3 Radio, EN 300 220-2 Safety, EN IEC 62368-1 Fire Resistance, BS EN 1634-1
Weight	57g
Mounting method	Double-sided tape or screw
Battery run time	Approx 24 months**

**door usage dependant

1.3 | Features

- Embedded ARM microcontroller and 868MHz LoRaWAN radio module.
 - 868MHz chip antenna for LoRaWAN comms.
 - UKCA/CE pre-certified.
- Hall sensor for door/door frame proximity measurement.
 - Senses a 10mm diameter x 2mm magnet mounted to door frame.
- Temperature/humidity sensor.
- Battery powered (AA-size, Li-SoCl₂, 3.6V, 2400mAh).
- UKCA/CE certified.

1.4 | Assembly

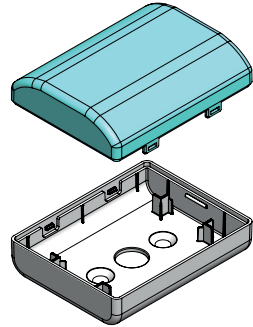
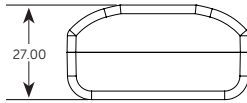
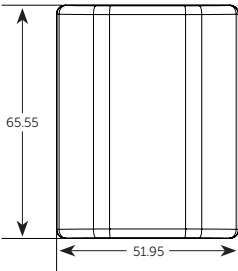
The assembly consists of a PCB and battery mounted inside a 2-part, snap-fit, plastic housing. A small magnet, bonded to the frame of the door being monitored, is required.

The enclosure is installed on a door using screws or double-sided tape. The magnet is bonded to the door frame using epoxy or double-sided tape.

Note: *as with all LoRaWAN devices, the door sensor requires a LoRaWAN gateway/network infrastructure with a connection to the internet (LAN, WiFi, cellular) in order to post transmissions to an end-point host.*

1.5 | Dimensions

The enclosure has the following dimensions:



1.6 | Power Source

The device is powered by a single, AA-sized, 3.6V, lithium thionyl chloride (Li-SOCI₂) primary cell battery. The capacity is typically 2600mAh. The battery is not re-chargeable and should be disposed of responsibly after use.

1.7 | Operating Conditions

The device operates over a temperature range of -10°C to +55°C.

1.8 | Approvals

The device is compliant to the following standards:

- EMC, EN 301 489-3, V2.2.3
- Safety, EN IEC 62368-1: 2020 +A11: 2020
- Radio, EN 300 220-2, V3.2.1
- Fire Resistance, device installed on fire door tested to BS EN 1634-1

According to

- Radio Equipment Directive (RED)
- Electromagnetic Compatibility (EMC) Directive

2 | DEVICE INSTALLATION AND OPERATION GUIDE

2.1 | Device Installation

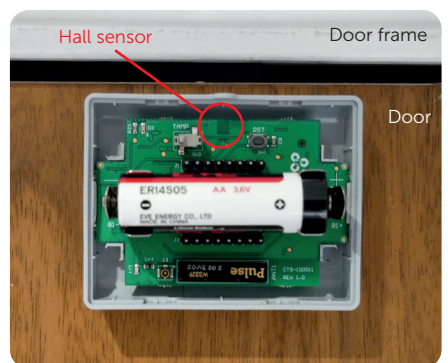
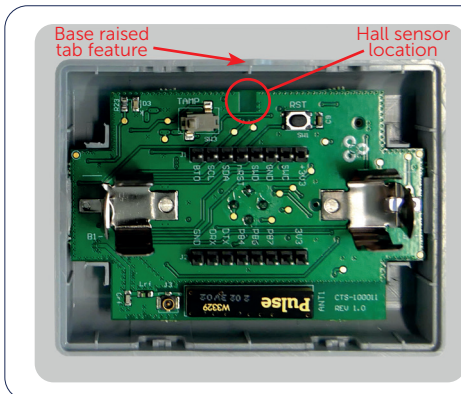
The enclosure can be mounted to the door using a piece of double-sided tape (not supplied) or two small self-tapping screws (not supplied). When installing at a height up to 2m, double sided tape is recommended. Above 2m in height, screws are recommended.

The unit should be positioned at the top of the door between the door closer and the non-hinge side. Alternatively, on the side of the door, towards the top. Being installed higher up reduces the potential for theft or tampering.



2.1.1 Double-Sided Tape

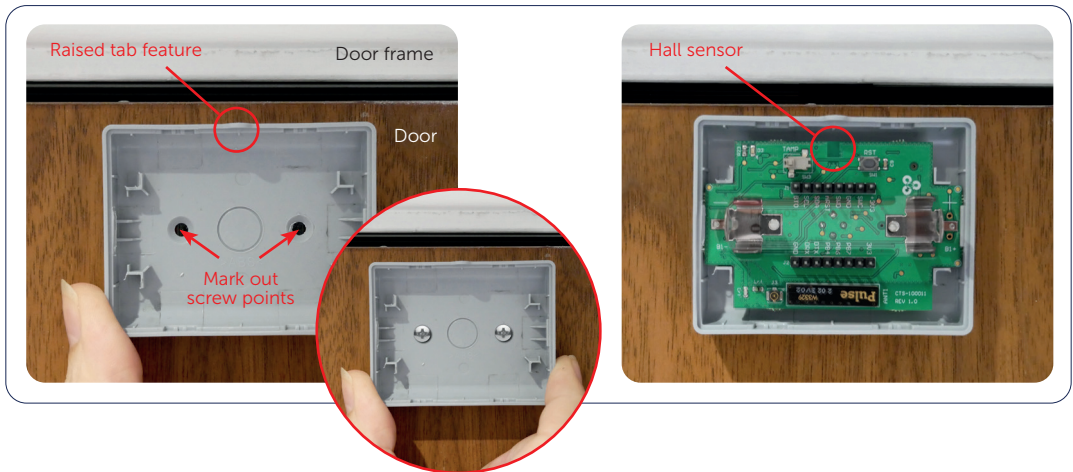
- Cut a piece of tape (30mm x 20mm) and place on the enclosure base.
- Example tape - 3M VHB 5952
- Remove double-sided tape backing and press/secure the enclosure to the door, checking that the raised-tab design feature is positioned towards the door frame. This ensures that the hall sensor is close to the door frame. Place the enclosure as close to the door frame gap as possible.



2.1.2 Screws

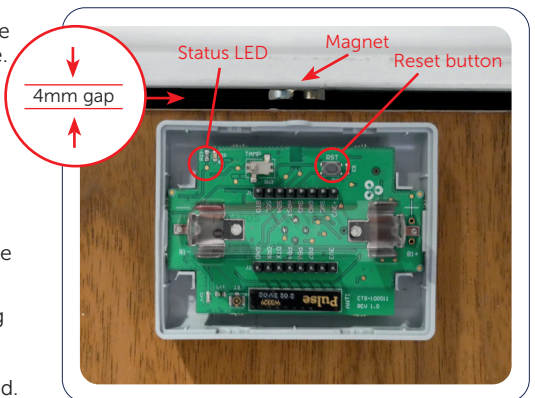
The enclosure base has two counter-sink holes for using small, self-tapping screws (example, PZ#1, 3mm x 12mm, countersunk wood screw).

- Carefully remove the PCBA from the enclosure base.
- Choose the desired install location on the door and mark out the screw locations.
- With two small self-tapping screws, secure the base to the door, checking that the raised tab feature is positioned towards the door frame.
- Snap fit PCB into the enclosure base, checking that the hall sensor is next to the raised feature.



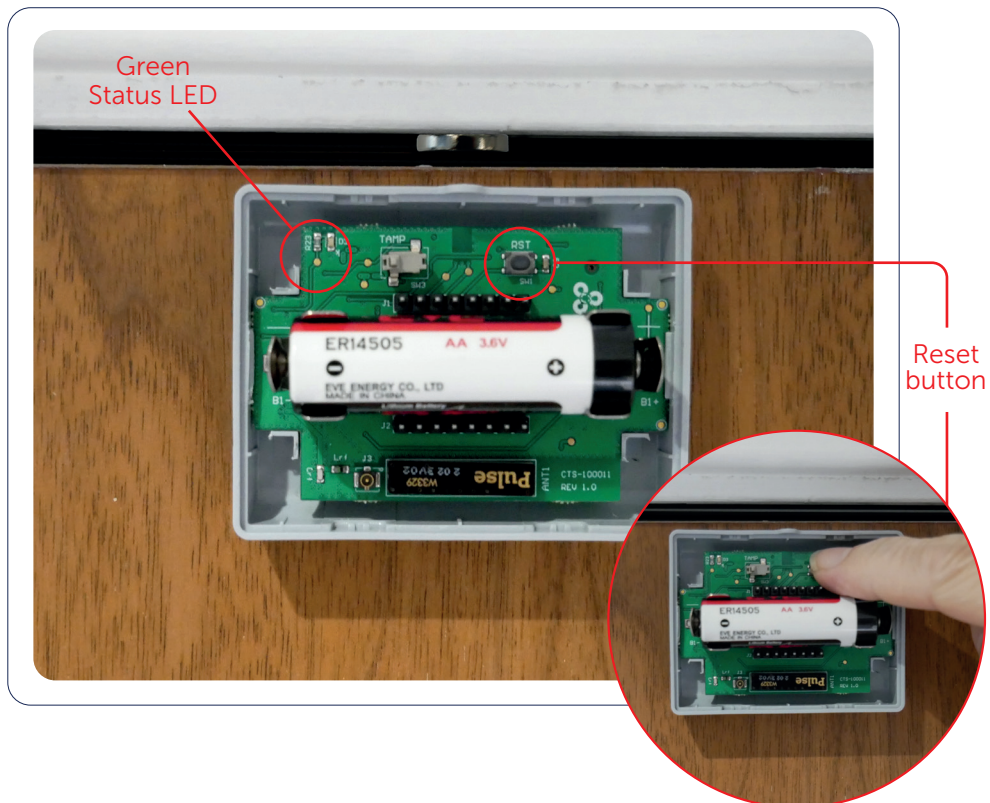
2.1.3 Magnet Install

- Noting the position of the hall-effect sensor, bond the small magnet into the gap between the door and door frame. The example below shows the relative positions of the hall sensor and the magnet.
- The magnet should be bonded as close to the door frame edge as possible.
- The minimum gap required to fit the magnet is 4mm.
- Test fit the magnet prior to bonding to ensure there is no fouling when then door is closed. Recessed the magnet in the door frame if required.



2.2 | Device Operation Guide

- With the door closed, install the battery. The PCB has polarity indicators to assist with correct orientation.
 - The green status LED will blink upon power up (and on each LoRaWAN broadcast).
 - The device measures the "CLOSED" magnetic field strength, then calculates (auto-calibrates) field-strength thresholds for the "AJAR" and "OPEN" states.
 - The AJAR state is when the door opens but does not clear the door frame.
 - The OPEN state is when the door opens and clears the door frame.
 - When the device successfully joins the LoRaWAN network, the status LED blinks 10 times rapidly. This should occur within 5-10s of power up/reset.



- After the battery has been installed, and with the door closed, the auto-calibration process can be repeated by pressing reset button.
- The device auto-broadcasts on door open/ajar alert status.
 - If the AJAR or OPEN (alert) state is active for 60s.
 - An alert frame is broadcast every 15mins if the AJAR or OPEN state persists.
 - The device immediately broadcasts an alert frame when the door returns to the CLOSED state.
- The device broadcasts an information frame every 60mins regardless of door state. The information frame consists of:
 - Cumulative door open count.
 - Temperature/humidity.
 - Battery health.
 - Tamper status (future use).
- Test by placing the door in AJAR and OPEN and CLOSED positions and monitor the LoRaWAN traffic.
- Once fitted, calibrated and successfully tested, place the enclosure cover on the device. The cover orientation is with respect to the raised tab feature on the base.
 - To remove the cover, pinch the sides and gently insert/twist a small flat head screw driver to separate the lid/base.

With the device registered on your LoRaWAN network service (LNS), the payload can be decoded there or forwarded via secure comms to a hosting site such as Azure or ArcGIS where it can be visualised over time using charts, graphs or icons.

2.2.1 LoRaWAN Packet Payload

Frame: Joined
Port: 4
Length: 9 bytes
Period: On join

Byte	0	1	2	3	4	5	6	7	8
Field	HW Version	SW Version	Prog Time	Battery	Alert	Closed Position			
	String	String	String	0-100 (%)	See Alert	float (mT)			

Frame: Sensor Information
Port: 5
Length: 7 bytes
Period: 60mins

Byte	0	1	2	3	4	5	6
Field	Open Counter		Temperature		Humidity	Battery	Alert
	0 - 65535		0.1 °C Signed MSB		0.5% Unsigned	0-100 (%)	See Port 6

Frame: Alert
Port: 6
Length: 1 byte
Period: On alert event **, then every 15mins if alert condition persists
 Immediate broadcast of 0x00 (no alert/closed) if door returns to closed position from the alert state.

Bits	7	6	5	4	3	2	1	0
Field	Unused					Door Alert		Tamper Alert
						0 - None 1 - Door ajar 2 - Door open		0 - Off 1 - On

** alert event => from the closed state, an ajar or open state which lasts for >60s.

3 | APPROVALS TEST REPORTS AND CERTIFICATES

The following Eurofins laboratory test reports and certificates are applicable to the door sensor.

3.1 | EMC

- Eurofins Test Report: G6489TR2
- Eurofins Test certificate: G6490TC1

3.2 | Safety

- Eurofins Test Report: G6503TR2
- Eurofins Test Certificate: G6561TC1

3.3 | Radio

- Eurofins Test Report: C15053TR1
- Eurofins Test Certificate: C15098TC1

3.4 | Fire Resistance

- UKTC Test Report TR20230908-004509

4 | DECLARATION OF CONFORMITY

4.1 | CE Mark



Declaration of Conformity

We,

CENSIS/CTS
Inovo Building
121 George Street
Glasgow
G1 1RD

do declare under our own responsibility that the product.

Reference	Name
CTS-LoRa-100011	Door Sensor, EU868

to which this declaration refers, is in conformity with the essential requirements, and other requirements, of the following standards:

- EMC, EN 301 489-3, V2.2.3
- Safety, EN IEC 62368-1: 2020 +A11: 2020
- Radio, EN 300 220-2, V3.2.1

According to

- Radio Equipment Directive (RED)
- Electromagnetic Compatibility (EMC) Directive


Glasgow, 19-June-2023.

Paul Winstanley.

Paul Winstanley, CEO, CENSIS/CTS.

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4.2 | UKCA



Declaration of Conformity

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 121 George Street
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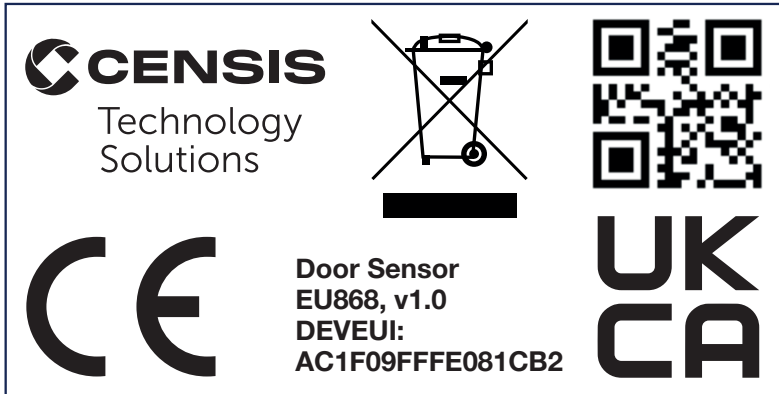


Paul Winstanley, CEO, CENSIS/CTS.

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5 | PRODUCT LABEL DRAWING

The device label layout, showing the necessary markings, is shown below.



- The intended label dimensions are 1" x 0.5" (25.4mm x 12.7mm).
- When printed, the CE, UKCA and WEEE symbols will be in the size/proportion as described in the labelling standard guide. In addition, the WEEE logo is also embossed on the device enclosure base.
- The serial number is based on the LoRaWAN DEVEUI (Device Extended Unique Identifier) which identifies the device as unique.
- The machine readable QR code contains the DEVEUI plus there is also a human readable version printed on the label.



Contact details:

CENSIS
The Inovo Building
121 George Street
Glasgow
G1 1RD

Web: [censis.tech](https://www.censis.tech)
Email: info@censis.tech