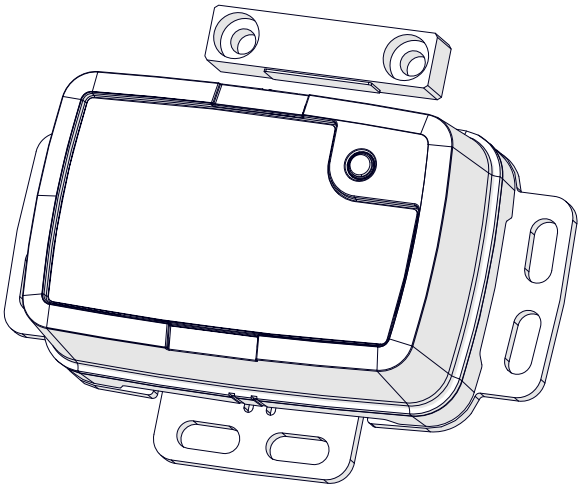
Contact Sensor

Product Manual



_NEON-CS_User-Manual_VS-XXX-01-CSXX_4001_A5

Version A5
06-02-2023

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1 Product Introduction

1.1 NEON Product Introduction

NEON stands for a standardised approach to collecting data points from the operational environment and in doing so, creates a general approach to integrated solutions within existing IT ecosystems.

The TWTG NEON product range supports all industrial customers moving towards LoRaWAN as the Industrial IoT network of the future.

The LoRaWAN network gives industrial operations a secure solution, which scales-up to tens of thousands of sensors, covers complete sites with only a small amount of gateways and best of all – the low-power approach means that the lifetime of the NEON products can be extended dramatically.

1.2 Related Documents

Document Name	Document Number
NEON Data Sheet	601_P20-017 NEON Data Sheet CS
NEON Product Sheet	602_P20-017 NEON Product Sheet CS
NEON Communication Protocol	NEON-Contact-Sensor_Communication-Protocol-v1_VS-xxx-01-CSxx_4003_1_A

Table 1: Related Documents

2 Getting Started

2.1 What you will need

In order to deploy the NEON Contact Sensor, a compatible and operational LoRa-WAN network architecture is required. This manual does not contain any instructions of how-to set-up and install LoRa-WAN networks.
TWTG offers radio network planning and IT architecture design services to fully integrate the products in the NEON product line.

2.2 What is in the box

When the product is delivered check the components for damage and if all box items mentioned below are included.

Box Items	
NEON Contact Sensor	1 battery, included in the product
NEON Sensor Magnet	1 per device
Magnet Key	1 per 20 devices
Product Sheet	incl. declaration of Conformity

Table 2: Box Items

3 Product Specifications

Product	
Product name	TWTG NEON Contact Sensor
Type identification Transmitter	VS-868-01-CS01 / VS-915-01-CS02 / VS-923-01-CS03
Environmental conditions	
Ambient temperature range	-40℃ - 80℃
Storage temperature range	10℃ - 30℃
Water & dust resistance	IP65
Mechanical	
Material	Molded plastic
Dimensions Sensor	95x64x39 mm
Installation	
Sensor	Screws, bolts, band clamp, tiewrap
Certifications	
ATEX 114 certificate number	DEKRA 18ATEX0106
IECEx 02 certificate number	IECEx DEK 18.0063
FCC ID	2ATYF-C19-001
FM ID US	FM20US0015X
FM ID CA	FM20CA0007X
Connectivity	
Protocol	LoRa-WAN
Frequency bands	See chapter 9.2 Radio Specification
Maximum RF output power	See chapter 9.2 Radio Specification

Table 3: Product specifications. See also "NEON datasheet" in Related Documents for a detailed overview of specifications.

Intended Region	
Europe	VS-868-01-CS01
US/Canada	VS-915-01-CS02
Singapore	VS-923-01-CS03
Malaysia	VS-923-01-CS04

Table 4: Intended Region

3.1 Product Nomenclature

Model name (aa-fff-cc-yy)	
aa	Product type
fff	Operating frequency
cc	Major revision number
yy	Indication of regional variant Serial number

Serial number (tt-fff-yy-xxxxxx)	
tt	Product type
fff	Operating frequency
yy	Year of manufacture
xxxxxx	Individual identifier

Figure 1: Contact Sensor product Nomenclature

3.2 Product Dimensions

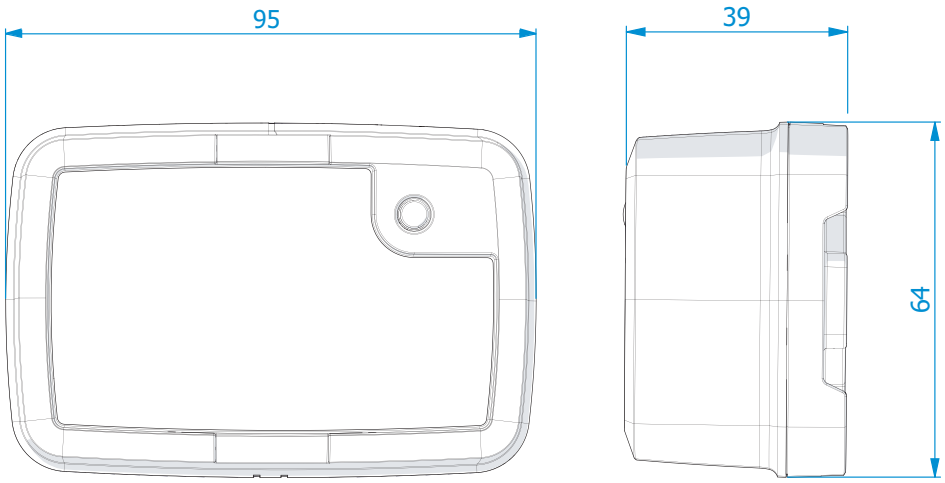


Figure 2: Neon Contact Sensor Dimensions (mm)

3.3 Installation

1: Installation needs to be performed according to IEC 60079-14;
2: Installation shall only be carried out by trained and authorised personnel;
3: Installation only as instructed in this installation manual.

The device works with LoRa WAN connectivity, a LoRa WAN network must be present for the sensor to operate.

For installation instructions please refer to the installation manuals at www.twtg.io/products/neon-contact-sensor/.

4 Warnings

English

- **WARNING - DO NOT OPEN WHEN AN EXPLOSIVE ATHMOSPHERE IS PRESENT**
- **WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS**

- DO NOT OPEN DEVICE;
- The device enclosure shall be cleaned only by the use of a water-dampened cloth. The use of dry cloths and / or chemical agents shall be prohibited;
- If damage to the enclosure is noticed, the discoverer shall immediately inform a competent and trained person, who shall remove the device from service as soon as possible, and return to the manufacturer;
- This equipment is only intended for use in restricted access areas;
- If the device doesn't function as documented, remove the product from the IECex / ATEX environment and dispose accordingly by returning it to the manufacturer;
- If a device is no longer connecting with gateways, it shall be returned to the manufacturer for examination;
- If a device is in contact with chemical materials please clean it appropriately.

French

- **AVERTISSEMENT - NE PAS OUVRIR EN PRESENCE D'UNE ATMOSPHERE EXPLOSIVE**
- **AVERTISSEMENT - DANGER POTENTIEL DE CHARGE ELECTROSTATIQUE – VOIR INSTRUCTIONS**

- NE PAS OUVRIR LE PRODUIT;
- Le boîtier ne doit être nettoyé seulement à l'eau, à l'aide d'un chiffon humide. Ne pas utiliser de chiffon sec ou/et quelconque produits chimiques;
- Si le boiter est endommagé, merci d'informer immédiatement un personnel qualifié afin de retirer le produit et de le retourner au fabricant;
- Le produit est dédié à une utilisation dans une zone sécurisée par un contrôle d'accès;
- En cas de dysfonctionnement fonctionnel du produit, le retire de toute zone explosive (ATEX/IECex) et le retourner au fabricant.;
- Dans l'éventualité où le produit ne communique pas/plus avec les routeurs installés sur site, le produit doit être retourner au fabricant pour de plus amples investigations;
- Dans l'éventualité où le produit entre en contact avec un produit chimique, le nettoyer en suivant les consignes ci-dessus.

5 User Interface

The device has one LED in the upper right corner to provide feedback to the user. To interact with the device, a magnet switch is present inside the product. To use this switch the user must be in possession of a magnet key, which should be placed as instructed below. The magnet key can be held in position for different actions in the process.

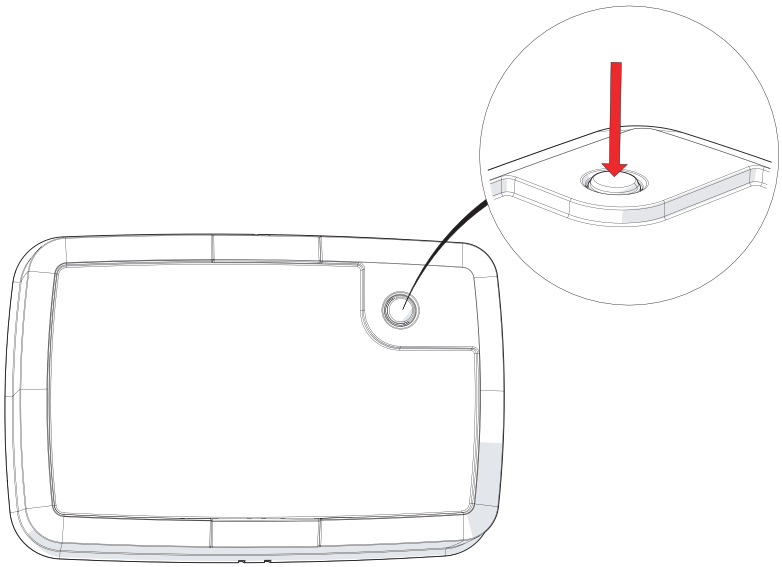


Figure 3: LED indicator on the device

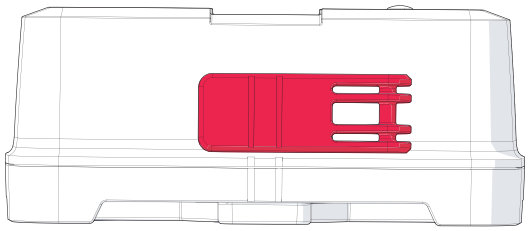


Figure 4: Placement of magnet key

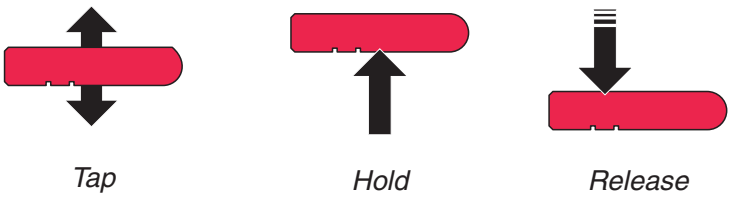
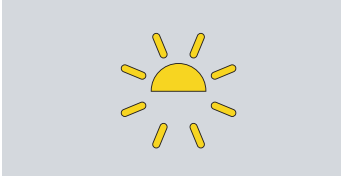


Figure 5: Magnet key icon definitions

5.1 Operating the Device

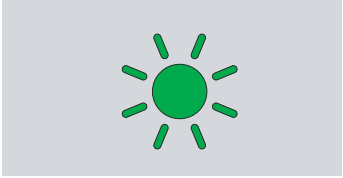
5.1.1 Turning on the device



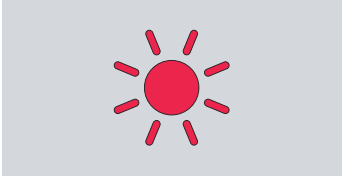
Yellow (Blinking): connecting / wait...

5.1.2 When Operational

Tap the magnet key to request the device state.



Green (Steady): application ready



Red (Steady): application not ready

6 Device Activation & Deactivation

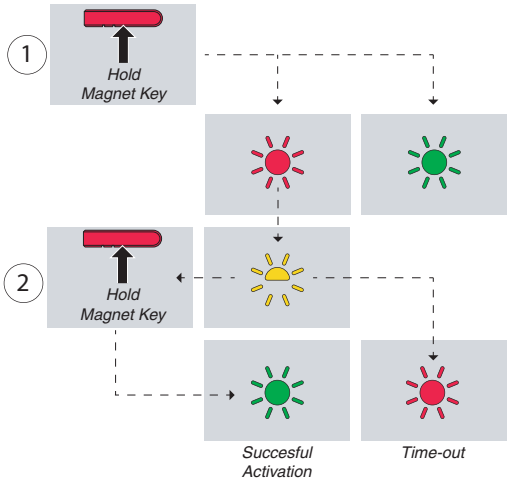
6.1 Turning on the device

Step 1 -Hold magnet key- on the indicators of the device and after 2 seconds the device will show its state;

- Red (Steady): **-Hold magnet key-**
  Device is turned off, proceed.
- Green (Steady): **-Release magnet key-** Device is turned on. No further steps are required.

Step 2 -Hold magnet key- for 4 more seconds;

- Yellow (Blinking): Connecting/wait...(max. 2min).
  - Red (Steady): Time-out/connection failed...(check network).
- Green (Steady): Device is turned on.



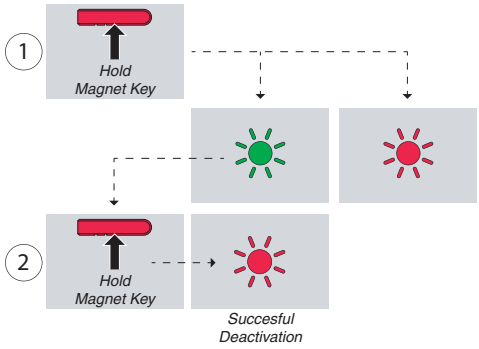
6.2 Turning off the device

Step 1 -Hold magnet key- on the indicators of the device and after 2 seconds the device will show its state;

- Green (Steady): **-Hold magnet key-** Device is turned on, proceed
- Red (Steady): **-Release magnet key-**
  Device is turned off, no further steps are required.

Step 2 -Hold magnet key- for 4 more seconds;

- Red (Steady): Device is turned off.



7 Troubleshooting

In exceptional cases connecting to the network might not succeed.

When the device is successfully connected to the network and problems occur, the troubleshooting should be performed on the network side. The device is working correctly.

7.1 Trouble shooting during activation

7.1.1 Time-out

A time-out is a time limit for establishing a connection;

- If a time-out occurs → time-out (steady red LED) → the device will turn off.

7.1.2 Blinking Yellow LED

A blinking yellow LED will stay active for a maximum of 2 minutes;

- If connecting to the network failed → time-out (steady red LED) → the device will turn off.

7.2 Trouble shooting during normal operation

7.2.1 Red LED

The red LED will stay on for a minimum of 5 seconds during normal operations;

- The sensor turns off and will reboot after 1 hour into normal operations.

7.2.2 Blinking Yellow LED

A blinking yellow LED will stay active for a maximum of 30 seconds;

- If connecting to the network failed → time-out (steady red LED) → the device will turn off.

8 Installation Methods

8.0.1 Installation using mounting holes

Place the bracket against the (flat) desired surface and use the screw holes or slots to fix in place.
Note: Slots and screw holes are designed for M6 fasteners.

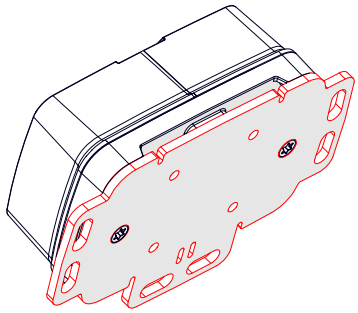


Figure 6: Mounting holes bracket

8.0.2 Installation using band clamp

The Neon Contact Sensor can be mounted on a pole using the extra bracket provided in the bracket kit using a 14 mm wide band clamp.

Procedure:

1. Place the band clamp through the bracket;
2. Place the band clamp around the pole and cut to size;
3. Place the band clamp through the adjustable tightener and fold around the bottom with pliers;
4. Place the band clamp around the pole with the (adjustable) tightener and fix it in place.

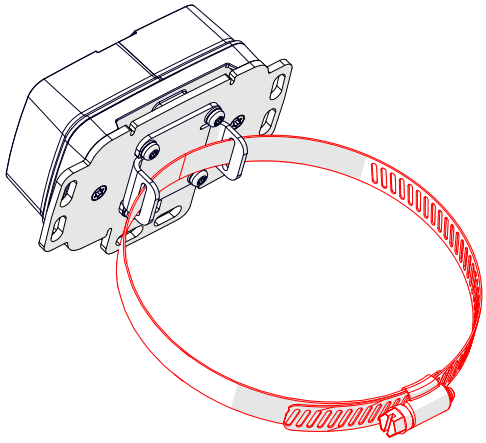


Figure 7: Installation using band clamp

8.0.3 Installation Sensor Magnet

Place the magnet against a (flat) surface and use the screw holes or slots to fix in place.
Note: Slots and screw holes are designed for M5 fasteners.

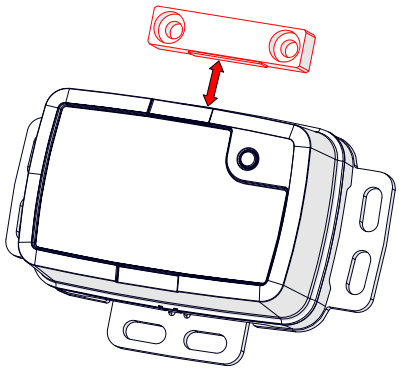


Figure 8: Use screw holes to fix Sensor Magnet in place (max. distance is 25mm)

9 Product Functionalities

A detailled description of setting-up communication and configuring device settings can be found in "Communication protocol". See "Communication Protocol" in Related Documents for a detailed explanation.

9.1 Application Event Message

The application event message contains information on the desired state of the asset. It is either triggered by a state transition, change in open levels or periodic (scheduled).

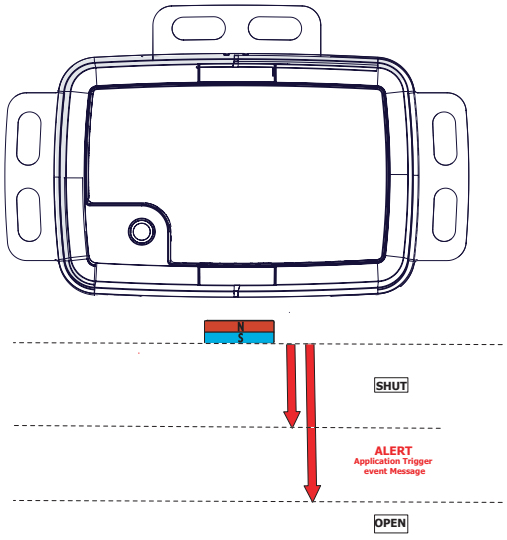


Figure 8: Application trigger event message

9.1.1 Event-triggers

Event-messages are triggered on one of the following triggers.

- **State change**:
  State change of the asset (Open or Shut)
  - *Threshold of application trigger (Open or Shut) event message is configurable.*

- **Timer (periodic)**:
  The timer trigger is configurable through the following configurations:
  - *magnet_measurement_interval_seconds*
    Interval in seconds, at which the NEON Contact Sensor is read.
  - *Periodic_event_message_interval_seconds*
    Interval in seconds at which the application event messages are periodically sent. The periodic counter is reset on every event message.

9.1.2 Content application event message

- **Trigger**
  Source of the trigger for the application event message:
  - "timer" (0);
  - "condition_0" (1);
  - "condition_1" (2);
  - "condition_2" (3);
  - "condition_3" (4).
- **Condition_n**
  The current state of each condition.

9.2 Device Status

Besides reporting on the valve state as outlined previously. The NEON Contact Sensor also reports on the device status itself. This is done through a device status messages. A device status message is sent periodically and includes a range of device health parameters, including the following:

- event_counter;
- battery_voltage;
- PCB temperature;
- tx_counter;
- avg_rssi;
- avg_snr.

See "Communication Protocol" in Related Documents for a detailed explanation.

9.3 Default Configuration

The Neon Contact Sensor is delivered with a default configuration. The default configuration includes:

- Measurement interval of 2 seconds;
- Device status message interval of 24 hours;
- Enabled confirmation message on all messages.

See "Communication Protocol" in Related Documents for a detailed explanation of all default configuration values.

10 Maintenance

10.1 Battery Replacement

The battery can be replaced using the battery replacement kit. This kit consists of the following parts:

- 1X SAFT LS-17500 battery
- 1X Gasket

10.1.1 Battery Specifications

Specifications	
Manufacturer	Saft
Part number	LS-17500
Quantity	1
Battery Type / Size	Type A
Chemistry	Lithium Thionyl Chloride
Terminal Type	Standard
Dimensions	50.9 x 17.13 mm
Battery Life	>10 years*

Table 5: Battery Specifications

**Note: Applicable to default configuration. Battery lifetime depends on average ambient temperature, network quality and device configuration.*

WARNING - Only use the battery as specified in table 5. Battery Specifications

10.1.2 Required tools

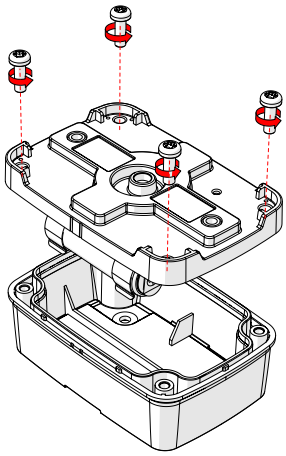
- Torque screwdriver with TX20 bit;
  - See 9.1.4 Assembly of the device for torque settings;
- Loctite 243;
- ESD strap.

IMPORTANT: ESD Sensitive Electronics

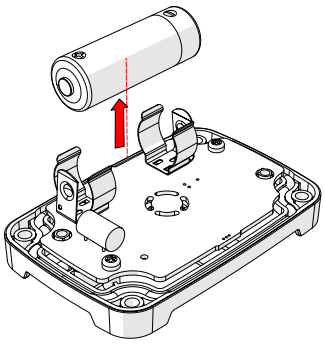
The product shall be installed in such a way that the risk for electrostatic discharges is minimised.

- Take proper precaution such as a grounded wrist strap and avoid touching the electronics board.

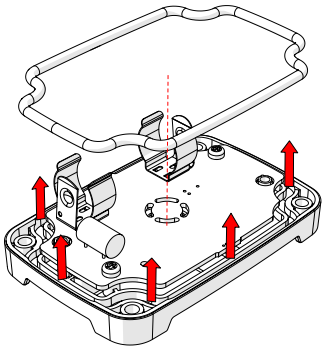
10.1.3 Disassembly of the device



Step 1: Remove the four screws and remove the lower housing

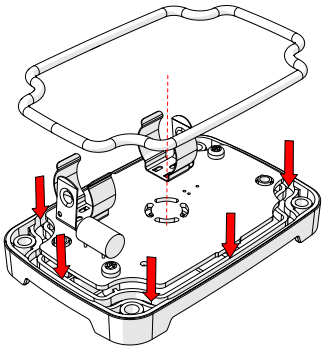


Step 2: Remove the battery

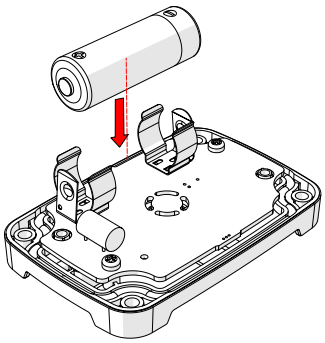


Step 3: Remove the gasket from the outer edge of the enclosure

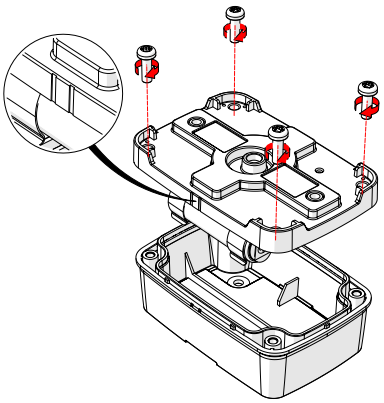
10.1.4 Assembly of the device



Step 4: Place the new gasket in the outer edge of the enclosure



Step 5: Place the new battery



Step 6: Place the lower housing back on the upper housing. Please make sure that the 2 cutout lines on the lower housing match the upper housing. Tighten the four screws to fix the lower housing (max. 1Nm)

11 General Notes

11.1 Do's and Dont'

1: Don't leave a magnet key near the device during and after installation;
2: Don't leave anything on the device after installation;
3: If the label is damaged, return the device for refurbishment;
4: If product or mounting parts are damaged, return the device for refurbishment.

11.2 Radio Specification

This product contains a LoRa radio modem operating at 868 MHz, 915 MHz or 923 MHz see tabel below. This product requires access to a LoRa gateway in order to function as described.

	Frequency range	Maximum power
LoRaWAN 868 MHz	868.0 - 868.6 MHz	13.8 dBm / 0.024 W
LoRaWAN 915 MHz	902.3 - 903.7 MHz	12.9 dBm / 0.0196 W
LoRaWAN 923 MHz	920.0 - 925.0 MHz	13.6 dBm / 0.0557 W

Table 6: Radio specification

Hereby, TWTG R&D B.V. declares that the radio equipment type "LoRa modem" is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: www.twtg.io/legal

11.3 Manufacturer information

TWTG R&D B.V.
Schaardijk 386
2909 LA Capelle a/d IJssel
The Netherlands
www.twtg.io

Complies with
IMDA Standards
DA108442

12 Regulatory Information FCC

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

12.1 RF exposure safety

This device complies with the FCC RF exposure limits and has been evaluated in compliance with mobile exposure conditions.
The equipment must be installed and operated with minimum distance of 20 cm of the human body.

12.2 Class B device notice

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.