Subject	Starting Guide	Project nr	C19-001
Project	NEON temperature sensor	Date	April 1st 2020

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1.0	JP	Initial document	08-04-2020

Introduction

Thank you for your interest in the TWTG NEON sensor product line. In this starting guide you will find the information needed to install and deploy the sensors and find directions to the relevant product documentations.

Product overview

NEON Temperature sensor

The TWTG NEON Temperature sensor measures the temperature of the surface of the object it is mounted on. It does so by contact probe which in connected to a digital sensor.

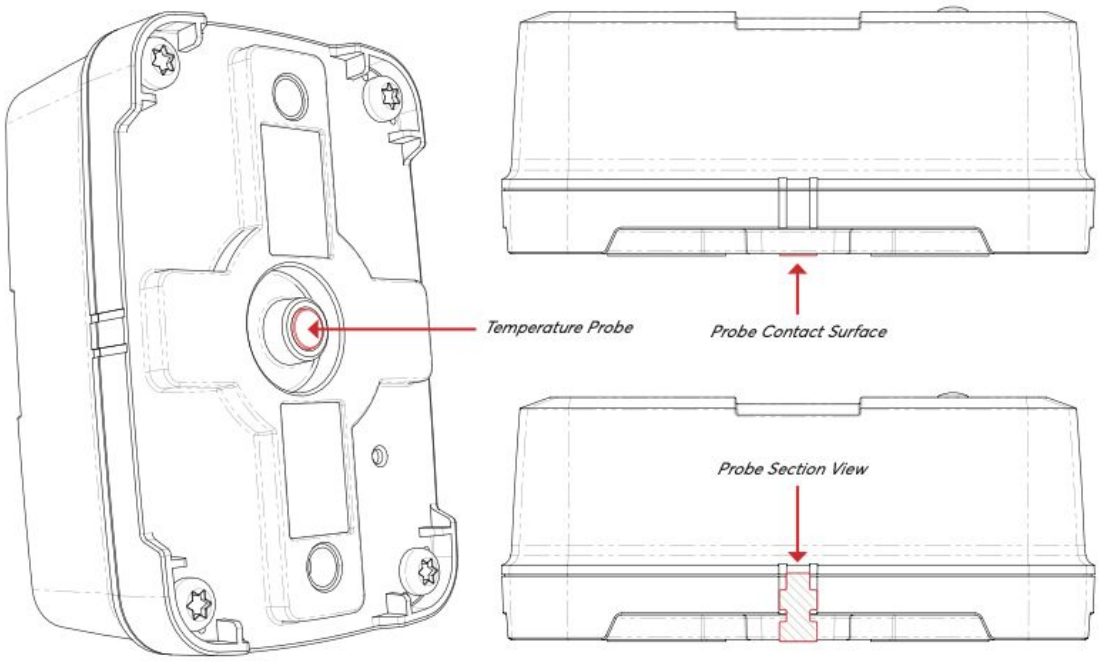


Fig. 12: Temperature Probe

Getting started

All TWTG'S Neon IIoT products use LoRaWAN as a communication method and are fully compliant with the LoRaWAN standard. In order to use these sensors a network with LoRaWAN coverage is needed on their location.

TWTG advises to use private hosted networks where possible in order to make the most use of all capabilities of the NEON products and their security measures. The devices are however capable to be used on public hosted LoRaWAN networks.

When the sensors are shipped the Over The Air activation keys will be shared securely.
Using these keys in the backend of your LoRaWAN network server (check the manual of the service you use) you need to pre-register the devices to the network in order to make the rest of the installation to go smoothly.

Documentation references

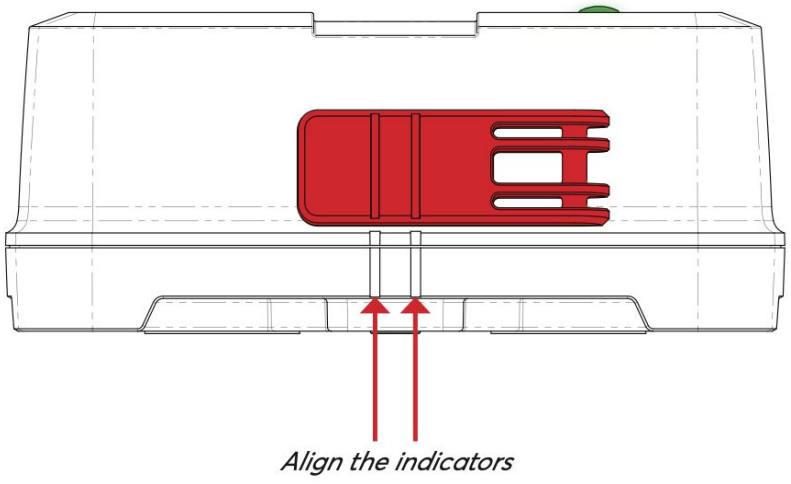
The following documentation is required for installation, deployment and use. In this starting guide you will find references to these documents.

1. Product manual
2. Communication Protocol
3. Product sheet

User interface

The NEON Temperature sensor can be operated by holding a magnet key near the 2 indication lines on the side of the product. This mechanism works much like a physical push button but restricts unauthorised or accidental operation. The RGB LED on top of the product will give feedback and instructions in the steps of the menu.

The magnet key can be either tabbed or held in place for a certain period of time in order to walk through different steps of the menu. E.G. push or hold like with a push button. The complete instructions can be found in product manual: *602_P18-023_Product-Manual-TS_V1-6.pdf*



Software

The sensor can be configured to send regular updates on min, max and average temperature readings within set intervals. Next to this, the sensor can be configured to alert when a set temperature is reached.

Event message

The alert function can be set to be both temperature and time dependent simultaneously. Below are 2 examples of the alert function:

1. An alert can be given when the temperature has increased with 5 degrees in 10 min
2. An alert can given when the set temperature of 65 degrees has been reached.

Message interval vs measurement interval

1. Measurement interval (seconds)
2. Send interval (in number of measurements)

Message contents: Min / Max / Average - temperature readings

For the complete description (ranges, units possibilities) of these settings please refer to: *Communication protocol - P18-023 - TS sensor*

LoRa Communication

The NEON Temperature sensor operates on the EU868 or US915 frequency band. In line with the LoRaWAN protocol, the communication can be 2 ways following the command/response process.

The following message types FROM the sensor are used:

1. Event message
2. Status message
3. Boot message: After a reboot the sensor will send a message containing information regarding the reboot reason amongst others. During normal operation the sensor will only reboot when communication has been persistently absent or when network performance is low.

NOTE: all messages that are send FROM the sensor can be acknowledged by the server. The default setting for this ON. To turn this functionality OFF, please refer to communication protocol in section “device configuration”: *Communication protocol - P18-023 - TS sensor*

The following message types TO the sensor are used:

1. Device configuration
2. Application configuration

Explanations on possible configurations, units, ranges and defaults please refer to “Device configuration” and “Application configuration” in: *Communication protocol - P18-023 - TS sensor*

Decoding the messages

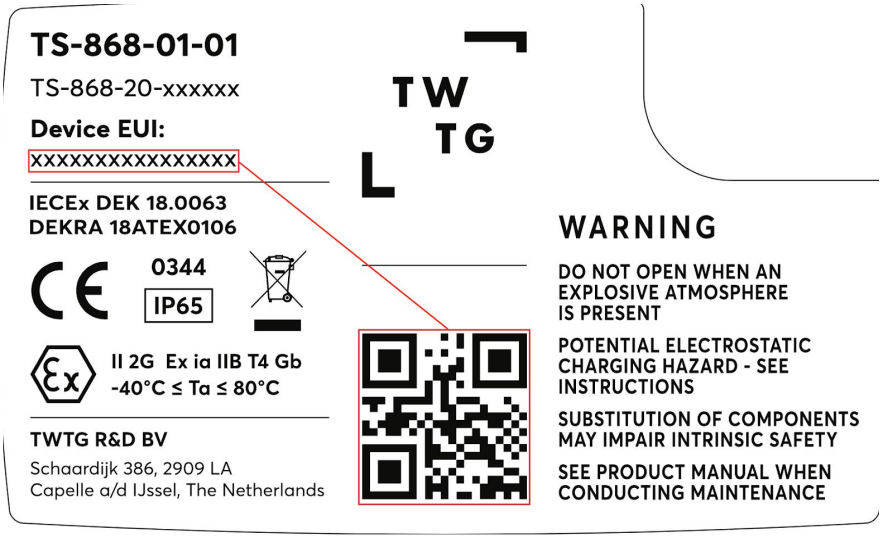
Messages that are received from the sensor can be decoded using a javascript decoder. The JSON structure can be found in: *Communication protocol - P18-023 - TS sensor*

Encoding the massages

Messages that are send to the sensor can be encoded using a javascript encoder.The JSON structure can be found in: *Communication protocol - P18-023 - TS sensor*

Recognising your sensor

Each NEON sensor can be recognised using the unique identifier. This identifier, called Dev EUI, can be used to identify you sensors in your LoRa server. The Dev EUI is present on the the product label in numbers/letters and inside the QR-code.



Battery Health

The condition of the battery can be determined by using the Voltage measurements that are included in the status message. For an accurate determination TWTG supplies the Solid Red module. When a less accurate determination is sufficient the below approach can be used.

The message includes the following parameters:

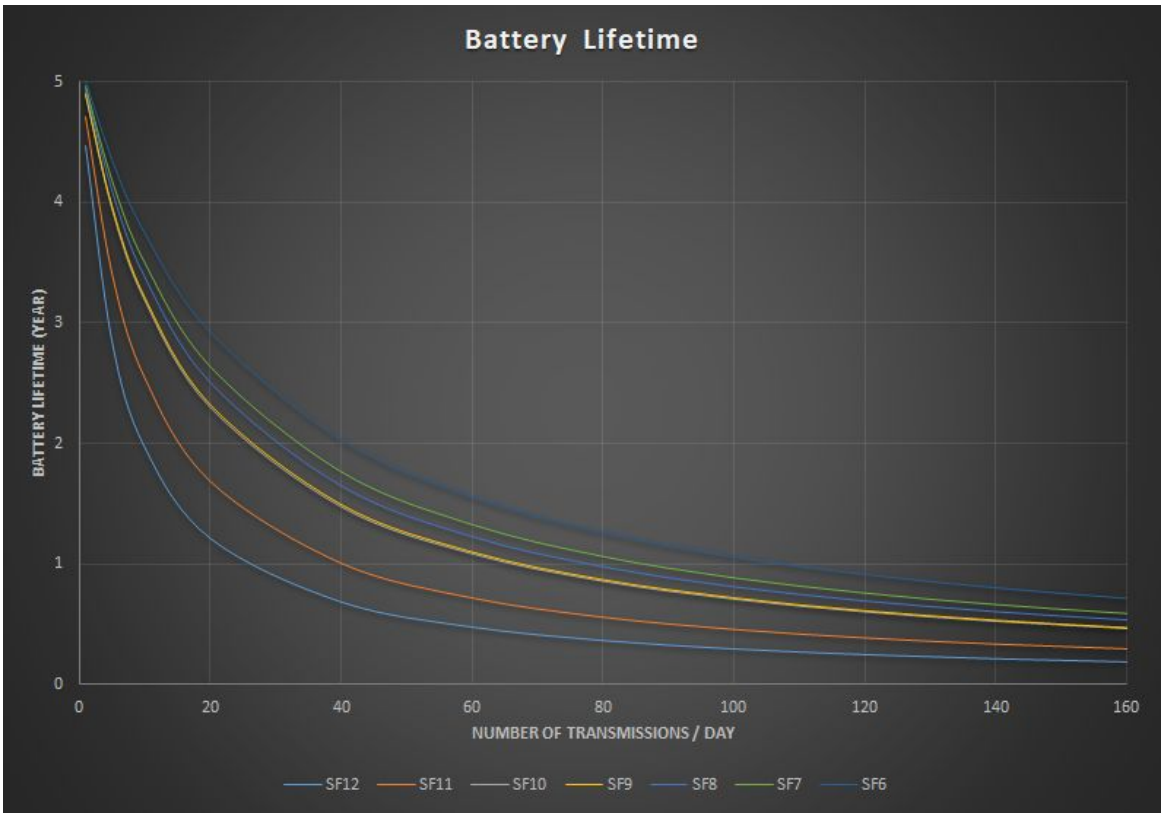
1. Battery voltage (low consumption) Voltage measurement in millivolt during low load
2. Battery voltage (high consumption) Voltage measurement in millivolt during high load
3. Battery voltage (settle after high consumption) Voltage measurement in millivolt right after high load.

When the voltage #2 is constant at around 3,3 V over time, the battery is in good health. An possible indicator for an almost depleted battery is a voltage below 3 V.

Notes:

1. Battery voltage is temperature dependant (current temperature and previous Environmental conditions). Above mentioned is for a temperature of 20℃.
2. Battery voltage is dependent on message frequentie.
3. The drop in voltage from 3,3V to below 3,0V can occur within a short time period.

Chosen configurations & Battery life

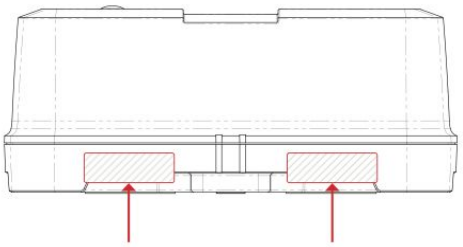


The lifetime of the battery is (mostly) depending on the number of messages that are sent and at which spreading factor this is done. In general the higher the spreading factor the longer it takes to send a message and the more energy will be used. The spreading factor will be automatically increased when the network environment between sensor and gateway requires it. In general, when the network quality is sufficient, the spreading factor will be between 6 and 8 and at average 4 - 6 messages per day the battery life will be between 3 and 5 years.

Installation

Mounting the sensor is very easy and can be done in 3 ways:

1. On magnetic surfaces, just place the sensor onto the surface using the internal magnets.



2. For non-magnetic surface peel away the backing of the double sided adhesive and firmly press the sensor onto the surface. Make sure the surface is clean, dust and grease free before mounting.

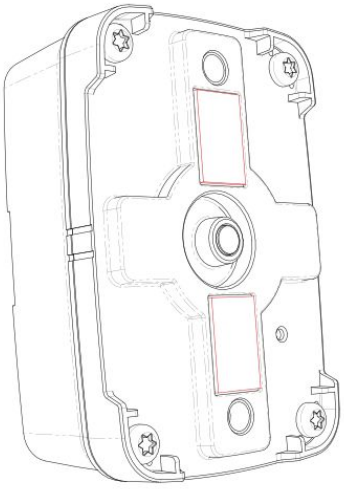


Fig. 15: Remove adhesive backing

3. For non-magnetic pipelines or other circular objects a band clamp may be used to strap the sensor to the surface.

For complete instructions see: *602_P18-023_Product-Manual-TS_V1-6.pdf*

Note: If a more accurate (absolute) temperature measurement is required, the object and the sensor may be insulated to reduce heat loss to the environment.