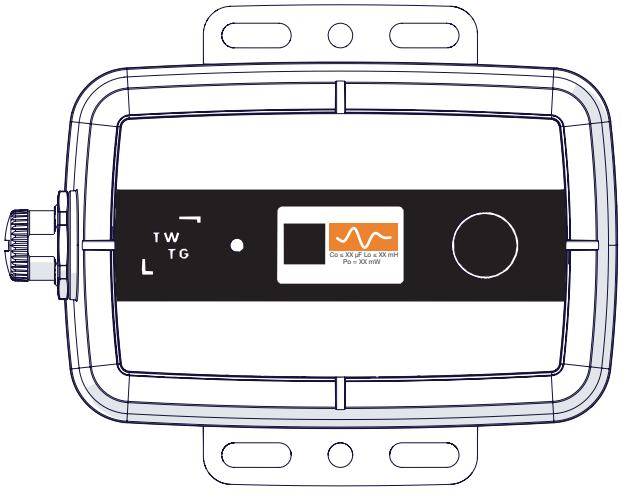
# NEON RT Transmitter

## Product Manual

This document applies to version 1 of the:
NEON Ratiometric Transmitter (DS-RT-02-XX)
NEON Pressure Sensor (DS-RT-PS-02-XX)
NEON Pressure Gauge (DS-RT-PG-02-XX)



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# 1 TWTG NEON

## 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 data collection 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 is extended dramatically.

## 1.2 Related Products

| Document name | Document number |
|---|---|
| NEON Vibration Sensor | 6016_N02-09_Data-Sheet-NEON-Vibration-Sensor_XX |
| NEON Temperature Transmitter | 6015_N02-0_Data-Sheet-NEON-Temperature-Transmitter_XX |
| NEON NFC Tag | 6003_P20-018_Datasheet-NEON-NFC-Tag_XX |
| NEON Temperature Sensor | 604_P18-023_NEON-Data-Sheet-TS_XX |
| NEON Contact Sensor | 601_P20-017_NEON-Data-Sheet-CS_XX |
| NEON Valve Sensor MT | 604_P19-005_NEON-Data-Sheet-VS-MT_XX |
| NEON Valve Sensor QT | 607_P18-023_NEON-Data-Sheet-VS-QT_XX |

**Table 1:** Related Products

## 1.3 What you will need

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

# 2 Getting Started

## 2.1 Compatibility of this manual

This manual is applicable to version 1 of the NEON Ratiometric Transmitter, NEON Pressure Sensor and NEON Pressure Gauge. This manual is meant to be used with products from a specific production batch;
See Product Type Identification for an explanation on how to retrieve the production batch code from the serial number;
See chapter Product Type Identification to determine the revision of the product.

## 2.2 Related Documents

| Document name | Document number |
|---|---|
| NEON Data Sheet Pressure Sensor | 6033_N02-09_Data-Sheet-NEON-Pressure-Sensor |
| Pressure Sensor installation manual | 520_Drucksensor_BA |
| NEON Data Sheet Pressure Gauge | 6036_N02-09_Data-Sheet-NEON-Pressure-Gauge |
| Pressure Gauge installation manual | PDS_PG_IOM_Badotherm |
| NEON Communication Protocol | 6020_N02-09_Communication-Protocol-NEON-Ratiometric-Transmitter |

**Table 2:** Related Documents

## 2.3 What is in the box

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

| Box Items Pressure Sensor (DS-PS-02-XX) | |
|---|---|
| NEON Ratiometric Transmitter | 1 battery assembly (included in the product)<br>1 mounting bracket (mounted on the product)<br>M12 connector (mounted on the product) |
| Sensor | Pressure Sensor |
| RT Sensor cable | DS-EC-02-AB03 (3 meter) |
| Declaration of Conformity | Declaration of Conformity, containing a link to latest version of this product manual and other relevant product documentation |

**Table 3:** Box Items Pressure Sensor

| Box Items Pressure Gauge (DS-PG-02-XX) | |
|---|---|
| NEON Ratiometric Transmitter | 1 battery assembly (included in the product)<br>1 mounting bracket (mounted on the product)<br>M12 connector (mounted on the product) |
| Sensor | Pressure Gauge |
| RT Sensor cable | DS-EC-02-AB03 (3 meter) |
| Declaration of Conformity | Declaration of Conformity, containing a link to latest version of this product manual and other relevant product documentation |

**Table 4:** Box Items Pressure Gauge

## 2.4 Product Specifications RT

| | |
|---|---|
| **Product** | |
| Product name | TWTG NEON Ratiometric Transmitter |
| Type identification | DS-RT-02-XX |
| **Environmental conditions** | |
| Operating temperature range Transmitter | -40 °F - 158 °F (-40 °C - 70 °C) |
| Storage temperature range | 50 °F - 86 °F (10 °C - 30 °C) |
| Operating humidity range | 0% - 100% RH |
| Altitude | Up to 3000 m |
| Water & dust resistance | IP65 |
| Pollution degree | 3 |
| Usage | Indoor and outdoor |
| **Mechanical** | |
| Material | Molded plastic |
| Weight (including mounting bracket) | 330 g |
| Dimensions | 100x70x57 mm |
| **Installation** | |
| Transmitter | Band clamp or bolts (not included) |
| **Power Supply specifications** | |
| Battery rated voltage | 3.6 V |
| Battery rated capacity | 17 Ah |
| **Functional specifications** | |
| Output | LoRaWAN |
| Input | M12 connector |
| Input insulation rating | 500VAC / 1 min |
| **Connectivity** | |
| Protocol | LoRaWAN |
| Frequency band | 868 MHz |
| | 915 MHz |
| | 923 MHz |
| Maximum RF output power | +13.98 dBm max |
| **Provisioning** | |
| Data matrix code / Serial number | Serial number (read only) |
| NFC | Serial number (read only) |

| | |
|---|---|
| **Supported sensors** | |
| Product name | TWTG NEON Pressure Sensor |
| Type identification | DS-PS-02-XX |
| Product name | TWTG NEON Pressure Gauge |
| Type identification | DS-PG-02-XX |

## 2.5 Certifications

| Certifications | |
|---|---|
| ATEX certificate | DEKRA 22ATEX0004X |
| IECEx certificate | IECEx DEK 22.0004X |
| ATEX IECex marking | Ex II 1G Ex ia IIC T4 Ga |
| ATEX/IECEx standards | EN/IEC 60079-0 |
| | EN 60079-0 |
| | IEC 60079-0 |
| | IEC 60079-11 |
| FM US certificate | FM22US0061X |
| FM CA certificate | FM22CA0043X |
| US Marking | IS Class I, Division 1, Group ABCD T4 |
| | Class I, Zone 0 Ex ia IIC T4 Ga |
| CA Marking | IS Class I, Division 1, Group ABCD T4 |
| | Ex II 1G AEx ia IIC T4 Ga |
| FM standards | FM Class 3600 |
| | FM Class 3610 |
| | FM Class 3810 |
| | FM Class 3810 |
| | ANSI/UL 60079-0 |
| | ANSI/UL 60079-11 |
| | CAN/CSA-C22.2 No. 61010-1 |
| | CAN/CSA-C22.2 No. 60079-0 |
| | CAN/CSA-C22.2 No.60079-11 |
| CE | EN 300 220-1 V3.1.1 |
| | EN 300 220-2 V3.2.1 |
| | EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 |
| | EN 62311:2020 |
| | EN 60529:1911+A1:2000+A2:2013 |
| | EN 301 489-1 V2.2.3 |
| | EN 301 489-3 V2.1.1 |
| UKCA | Radio Equipment Regulation 2017 |
| WEEE | Directive 2033/108/EC |
| RoHS | 2011/65/EU |
| FCC | FCC CFR 47, Part 15, Subpart C |
| | FCC CFR 47, Part 15, Subpart B |
| ISED | USA FCC Part 15.209, 15.247, 15.205 RSS-247, RSS-Gen |
| ICES | CAN ICES-003(B) / NMB-003(B) |

**Table 5:** Product specifications. See also "NEON datasheet" in Related Documents for a detailed overview of specifications.

## 2.6 Product Identification

### 2.6.1 NFC

The NFC label is located in the identification sticker and programmed with the serial number of the device. The serial number read from the NFC can be used as unique identifyer for provisioning and registration.

### 2.6.2 Data Matrix Code

The Data Matrix Code label also represents the serial number of the device. The serial number can be used as an unique identifyer for provisioning and registration. See Product Type Identification for a detailed label description.

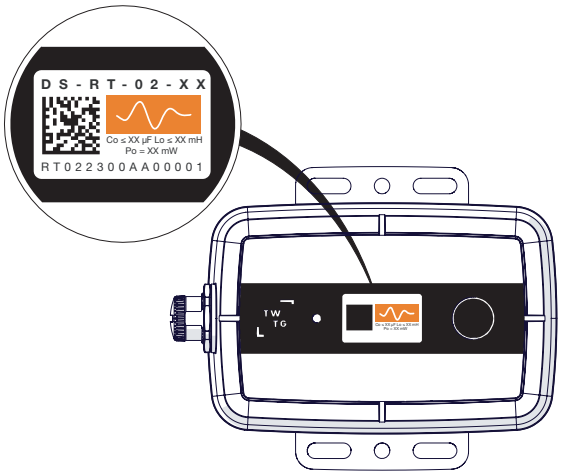



**Figure 1:** NFC and Data Matrix Code location

## 2.7 Product Dimensions

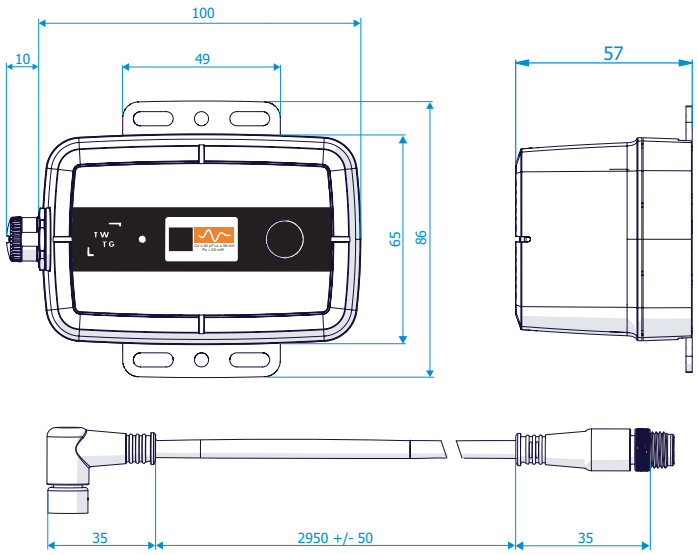



**Figure 2:** Neon Transmitter & cable dimensions (mm)

## 2.8 Component Names

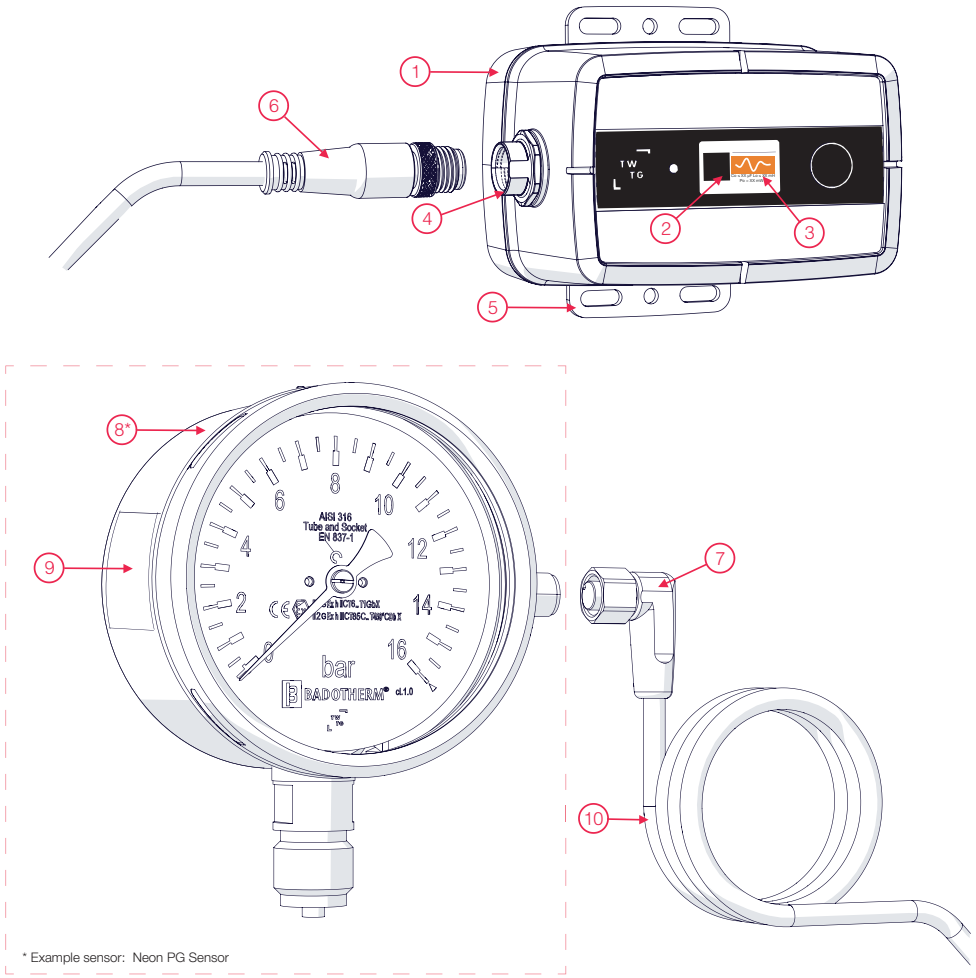
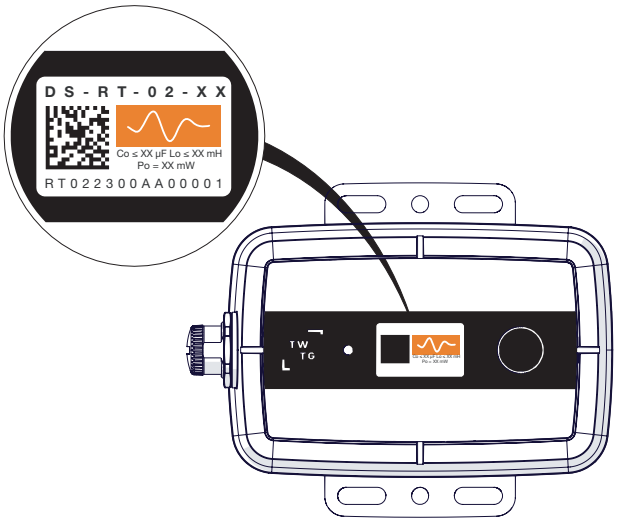



**Figure 3:** Component Names

| Number | Description |
|---|---|
| 1 | Neon Transmitter |
| 2 | Data Matrix Code |
| 3 | NFC |
| 4 | M12 Connector transmitter |
| 5 | Mounting Bracket |
| 6 | M12 straight connector |
| 7 | M12 angled connector |
| 8 | *Neon PG Sensor (other ratiometric sensor possible) |
| 9 | PG Sensor label |
| 10 | Cable label |

**Table 6:** Component Names

## 2.9 Product Type Identification



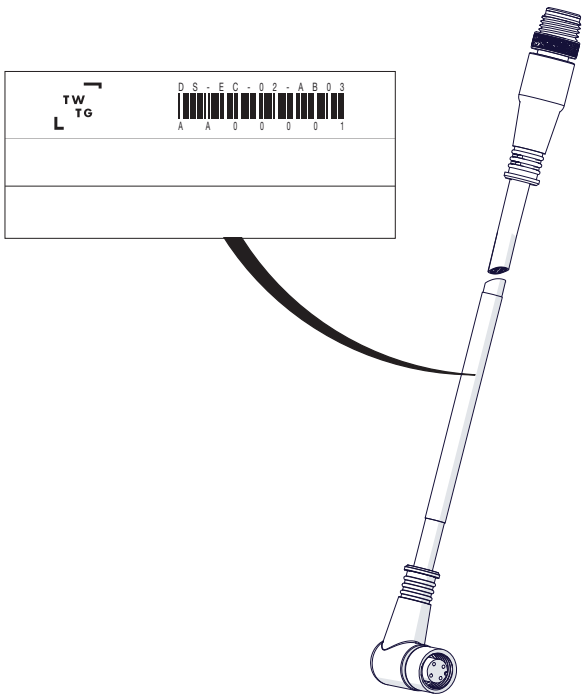

| AA-BB-CC-DD | |
|---|---|
| AA - Product Family | DS |
| BB - Product Variant | RT = Ratiometric Transmitter |
| CC - Main Revision | E.g. 02 |
| DD - Region | E.g. 00 = Global |

Product Nomenclature

| AABBCCDDEEFFFFF | |
|---|---|
| AA - Product Variant | RT = Ratiometric Transmitter |
| BB - Product Revision | E.g. 02 |
| CC - Production Year | E.g. 23 = 2023 |
| DD - Region | E.g. 00 = Global |
| EE - Production Batch | E.g. AA |
| FFFFF - Serial Number | E.g. 00001 |

Serial Number

**Figure 4:** Transmitter product identification



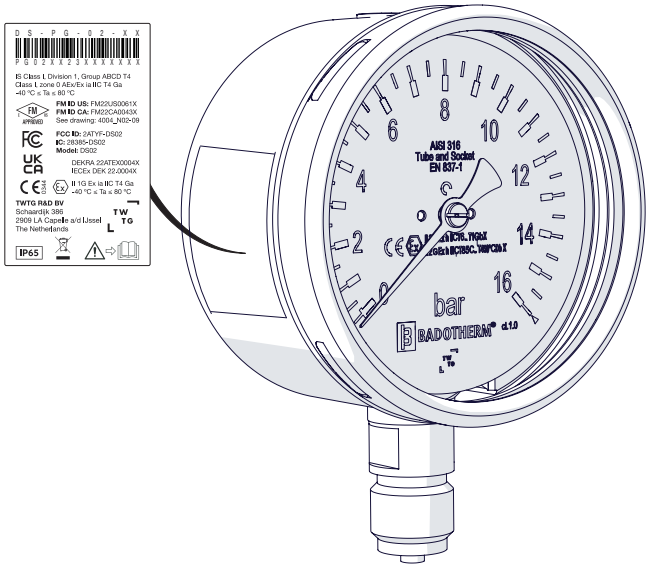

| AA-BB-CC-DD-EE | |
|---|---|
| AA - Product Family | DS |
| BB - Product Variant | EC = Extension Cable |
| CC - Main Revision | E.g. 02 |
| DD - Connector | M12 straigth / M12 angled |
| EE - Cable length | 3m |

Product Nomenclature

| AABBCCDDEEFFFFF | |
|---|---|
| AA - Production Batch | E.g. AA |
| BBBBB - Serial Number | E.g. 00001 |

Serial Number

**Figure 5:** RT extension cable product identification




| AA-BB-CC-DD | |
|---|---|
| AA - Product Family | DS |
| BB - Product Variant | PG = Pressure Gauge |
| CC - Main Revision | E.g. 02 |
| DD - Region | E.g. 00 = Global |

Product Nomenclature

| AABBCCDDEEFFFFF | |
|---|---|
| AA - Product Variant | PG = Pressure Gauge |
| BB - Product Revision | E.g. 02 |
| CC - Region | E.g. 00 = Global |
| DD - Production Year | E.g. 23 = 2023 |
| EE - Production Batch | E.g. AA |
| FFFFF - Serial Number | E.g. 00001 |

Serial Number

**Figure 6:** PG product identification

# 3 Warnings

## 3.1 ATEX / IECEx

### 3.1.1 Specific Conditions of Use

**WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD**

- The product shall be installed in such a way that the risk for electrostatic discharges is minimised;
- When the equipment is used in hazardous locations, avoid any actions which generate electrostatic discharge;
  - Cleaning: The equipment shall only be cleaned using a wet cloth;
  - Installation: Touch non-metallic parts with an insulating object;
  - Environment: Do not use the product in environments with powerful charge generating processes.

### 3.1.2 Installation

- This equipment shall be installed according to NEN-EN-IEC 60079-14 and the installation instructions;
  - The DS-RT-02-XX and DS-PG-02-XX, or connected ratiometric sensor, must be individually connected to earth
- This equipment is intended for fixed installations only;
- This equipment is intended for use in restricted access areas only;
- To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

**WARNING - DO NOT OPEN WHEN AN EXPLOSIVE ATHMOSPHERE IS PRESENT**

- Under no circumstances shall the equipment enclosure be opened within a hazardous area

### 3.1.3 Operation

- The connector of this equipment shall not be connected when an explosive atmosphere is present;
- This equipment shall only be used in environments where electromagnetic field strength is limited according to NEN-EN-IEC 60079-14;
- This equipment is only intended for use in combination with NFC Forum Tag 2 Type technical specification compatible readers;
- This equipment shall only be used within ambient temperatures between -40 ℃ and +70 ℃.

### 3.1.4 Service

- This equipment shall only be opened by TWTG or by a competent instructed person;
  - The battery is serviceable by said persons;
  - Only replace the battery in a non-hazardous location;
  - Only use Tadiran S1P1/SL-2780/323/TWT battery assembly;
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- If damage to the enclosure is evident, a trained and competent person shall be immediately informed, who shall remove the device from service as soon as possible;
- If the equipment is or has been in contact with chemical materials, clean it appropriately.

### 3.1.5 Output parameters

The maximum output parameters are limited by the NEON Transmitter. When selecting the sensor to be used with the transmitter, the following values must be taken into account:

**Control drawing**

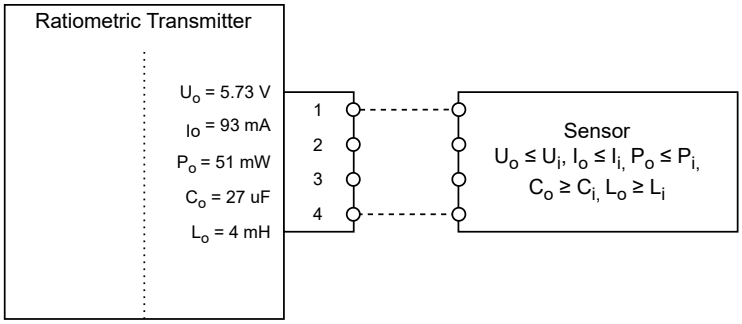



**Figure 7:** Intrinsic Safety Limiting Values

**Simple intrinsically safe sensors with distributed capacitance / inductance:**

$$C_o = 27\mu F$$

$$L_o = 4mH$$

**Configuration with mixed intrinsically safe circuits**

When:

- $C_{i,sensor}$ (excluding cable) $<$ 1% of $C_o$ **or,**
- $L_{i,sensor}$ (excluding cable) $<$ 1% of $L_o$

Maximum values of $C_o$ and $L_o$ may be used:

$$C_o = 27\mu F$$

$$L_o = 4mH$$

When:

- $C_{i,sensor}$ (excluding cable) $>$ 1% of $C_o$ **and,**
- $L_{i,sensor}$ (excluding cable) $>$ 1% of $L_o$

$C_o$ and $L_o$ needs to be limited to:

$$C_o = 0.1\mu F$$

$$L_0 = 2mH$$

### 3.1.6 Extension cable

- This equipment must not be used with M12 extension cables where both connectors are electrically connected to the cable shield.
- The cable used to connect the DS-RT-02-XX with either the DS-PG02-XX or the radtiometric sensor must adhere to the following specifications:
  - General

    - Temperature range $-40\,°C$ to $+80\,°C$
  - Connectivity
    - M12 Type A 4 pin connector
    - Side 1: Socket / Female
    - Side 2: PLug / Male
  - Jacket (For example PUR or TPU)
    - Oil Resistant
    - Tear and notch resistant
    - Flame retardant according to IEC 60332-1-2
  - Shielding
    - Tinned-copper/steel braiding
    - Shielding must only be connected to one connector
  - Isolation
    - Dielectric strength
      - Minimum $0.5kV/1min$ (Conductor to Conductor)
      - Minimum $0.5kV/1min$ (Conductor to Shield)
- Capacitance and inductance per cable length must be evaluated to make sure that the cable and ratiometrice sensor, or cable and DS-PG-02-XX, combined have a lower capacitance and inductance than Co and Lo of the DS-RT-02-XX

## 3.2 General

### 3.2.1 Transport and Storage

- The product must be kept in its original packaging until it reaches the installation site to prevent damage while in transit;
- The storage location must be dry;
- The product must not be exposed to vibrations or impact during storage.

### 3.2.2 Warranty

- The warranty covers the period noted on the quotation;
- If the device doesn't function as documented, the customer should contact TWTG and provide the following information;
  - Model specification;
  - Serial number;
  - Circumstances under which the problems developed;
  - Any previously generated data;
- The party responsible for the costs of solving the problem shall be determined by TWTG on the basis of an investigation conducted by TWTG.

### 3.2.3 Warranty will be void in case of

- Malfunction due to ignoring the design specifications;
- Malfunction due to modification of the product carried out by the user;
- Deferred maintenance of the product or the installation location.

# 4 Avertissements

## 4.1 ATEX / IECEx

### 4.1.1 Conditions spécifiques d'utilisation

**ATTENTION – RISQUE POTENTIEL DE DECHARGES ELECTROSTATIQUES**

- Le produit doit obligatoirement être installé de manière à minimiser le risque de décharges électrostatiques;
- Lorsque l'équipement est utilisé dans un environnement dangereux, évitez strictement toute action générant une décharge électrostatique;
  - Nettoyage: L'équipement doit être nettoyé uniquement à l'aide d'un chiffon humide;
  - Installation: Toucher les parties non métalliques qu'avec un objet isolant;
  - Environnement: N'utilisez pas le produit dans des environnements générant de fortes charges d'électricité.

### 4.1.2 Installation

- Cet équipement doit être installé conformément à la norme NEN-EN-IEC 60079-14 et aux instructions d'installation;
- Cet équipement est uniquement destiné aux installations fixes;
- Cet équipement est uniquement destiné à être utilisé dans des zones à accès restreint.

**ATTENTION – NE PAS OUVRIR DANS UNE ATMOSPHÈRE EXPLOSIVE**

- Le boîtier de l'équipement ne doit en aucun cas être ouvert dans une zone dangereuse.

### 4.1.3 Fonctionnement

- Le connecteur de cet équipement ne doit être utilisé qu'avec un équipement externe tel qu'indiqué dans le "product matrix";
- Le connecteur de cet équipement ne doit jamais être connecté dans une atmosphère explosive;
- Cet équipement ne doit être utilisé que dans un environnement où l'intensité du champ magnétique est limitée conformément à la norme EN 60079-14;
- Cet équipement est uniquement destiné à être utilisé en combinaison avec des lecteurs compatibles dont les spécifications techniques respectent la norme des tags NFC de Type 2;
- Cet équipement ne doit être utilisé qu'à des températures comprises entre -40 °C et +70 °C.

### 4.1.4 Entretien

- Cette pièce d'équipement ne doit être ouverte que par TWTG ou par une personne compétente et selon le guide d'utilisation;
  - La batterie peut être mise à neuf par ces personnes;
  - Ne remplacez la batterie que dans un endroit sans danger;
  - Utilisez uniquement l'ensemble de batterie Tadiran S1P1/SL-2780/323/TWT ;
- Si le boîtier est endommagé, informez immédiatement une personne compétente pour qu'elle vienne récupérer l'équipement;
- Si l'équipement est (ou a été) en contact avec des substances chimiques, nettoyez-le de manière appropriée.

### 4.1.5 Output parameters

The maximum output parameters are limited by the NEON Transmitter. When selecting the sensor to be used with the transmitter, the following values must be taken into account:

**Control drawing**

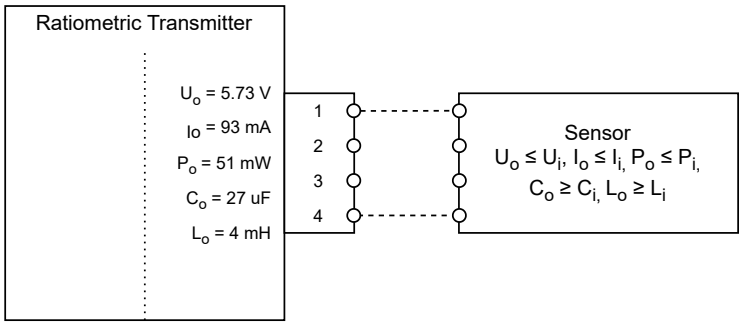



**Figure 8:** Intrinsic Safety Limiting Values

## 4.2 Informations générales

### 4.2.1 Transport et stockage

- Le produit doit être conservé dans son emballage jusqu'à ce qu'il atteigne le site d'installation pour éviter tout dommage pendant le transit;
- Le lieu de stockage doit être sec;
- L'appareil ne doit pas être exposé à des vibrations ou à des chocs pendant le transport et le stockage.

### 4.2.2 Garantie

- La garantie couvre la période indiquée sur le devis;
- Si l'appareil ne fonctionne pas comme prévu, le client doit contactez TWTG et fournir les éléments suivants;
  - Spécifications du modèle;
  - Numéro de série;
  - Les circonstances dans lesquelles les problèmes sont survenus;
  - Toutes les données précédemment générées;
- La partie responsable des coûts de résolution du problème sera déterminée par TWTG sur la base d'une enquête privée menée par TWTG.

### 4.2.3 La garantie sera annulée dans les cas suivants:

- Non-respect des spécifications du modèle;
- Modification du produit effectuée par l'utilisateur;
- Entretient non conforme aux spécifications du produit;
- Utilisation dans un endroit non conforme aux spécifications.

# 5 Provisioning

## 5.1 User Interface

The product contains one Light Emitting Diode (LED) to communicate with the user. In order to interact with the device a button is present on the right side of the NFC label.

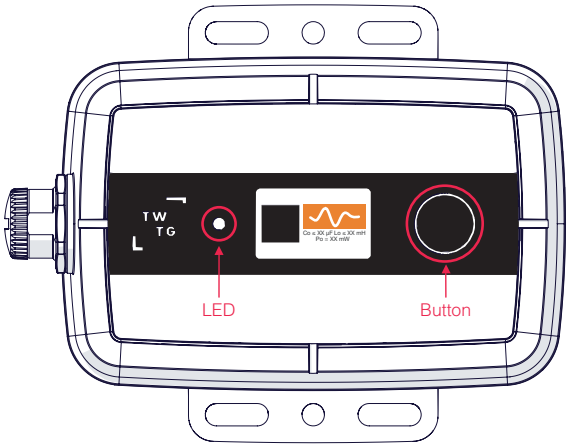



**Figure 9:** NEON Ratiometric Transmitter Interface

## 5.2 Operating the Device

**Press and Release**

**Press and Hold**

**Release**

**Red (Illuminated 2 s)**
Deactivated

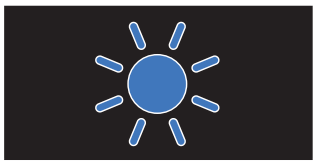
**Red (Illuminated)**
Failed

**Green (Illuminated 2 s)**
Activated

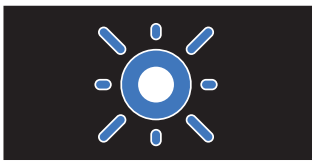
**Green (Illuminated)**
Passed

**White (Blinking)**
Connecting

**White (Illuminated)**
Calibrating



**Blue (Illuminated)**
Action / Handling Required



**Blue (Flashing each second)**
Button is being hold

### 5.2.1 Read device status

**1. Press & release the button and the device will immediately show its status:**

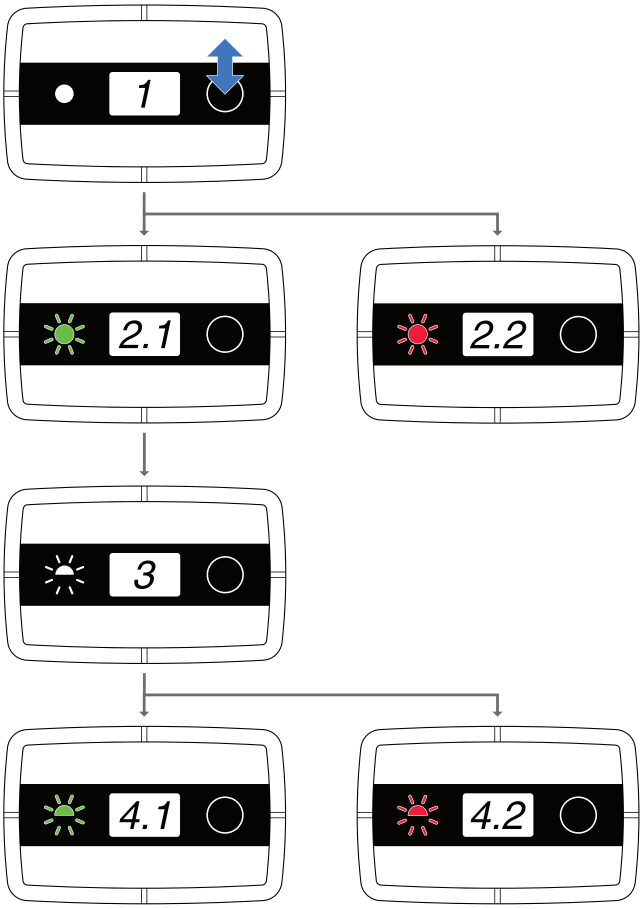
- **2.1 Green (Illuminated):** Device is activated
- **2.2 Red (Illuminated):** Device is deactivated

**If the device is activated it will try to send the Device Status message over LoRa (using default configuration):**

- **3. White (Blinking):** Connecting to network

**Within a typical maximum of 3 minutes*, the device will show:**

- **4.1 Green (Blink 2x):** Message sent, or
- **4.2 Red (Blink 2x):** Failed to connect to send message / connect to network




*Notes:*

- *The NEON Transmitter can be configured to send a Sensor Data message upon a button press. In this configuration the Sensor Data message will be sent after the Sensor Event message;*
- **All timeout and retry values are valid for the default configuration, the maximum timeout might be longer when process is performed repeatedly due to RF duty cycle limitations.*

### 5.2.2 Device Activation

**1. Press & hold the button for 5 seconds**
During the button hold the LED will blink Blue each second.

**2. After holding the button for 5 seconds the device will first check the LoRa network:**

- **3.1 White (Blinking):** Checking LoRa network

**4. Within a typical maximum of 3 minutes* the device will show:**

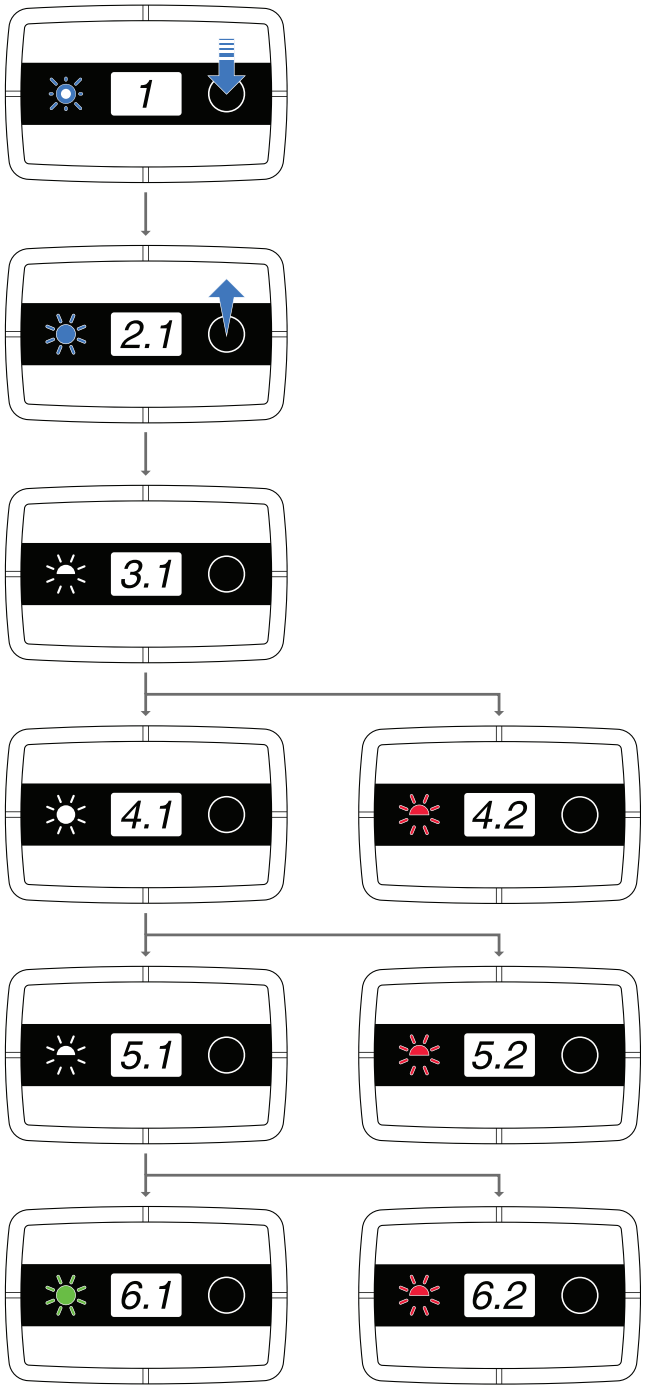
- **4.1 White (Illuminated):** Checking sensor communication
- **4.2 Red (Blink 2x):** Check network

**5. Within 30 seconds max. the device will show:**

- **5.1 White (Blinking):** Sending activation over LoRa
- **5.2 Red (Blink 2x):** Check sensor

**6. After communicating over LoRa, within a typical maximum of 3 minutes*, the device will show:**

- **6.1 Green (Illuminated):** Activated, or
- **6.2 Red (Blink 2x):** Check network




*Notes:*

- **All time out and retry values are valid for the default configuration, the maximum time out might be longer when process is performed repeatedly due to RF duty cycle limitations.*

### 5.2.3 Device Deactivation

**1. Normal Configuration**
During the button hold the LED will blink Blue each second.

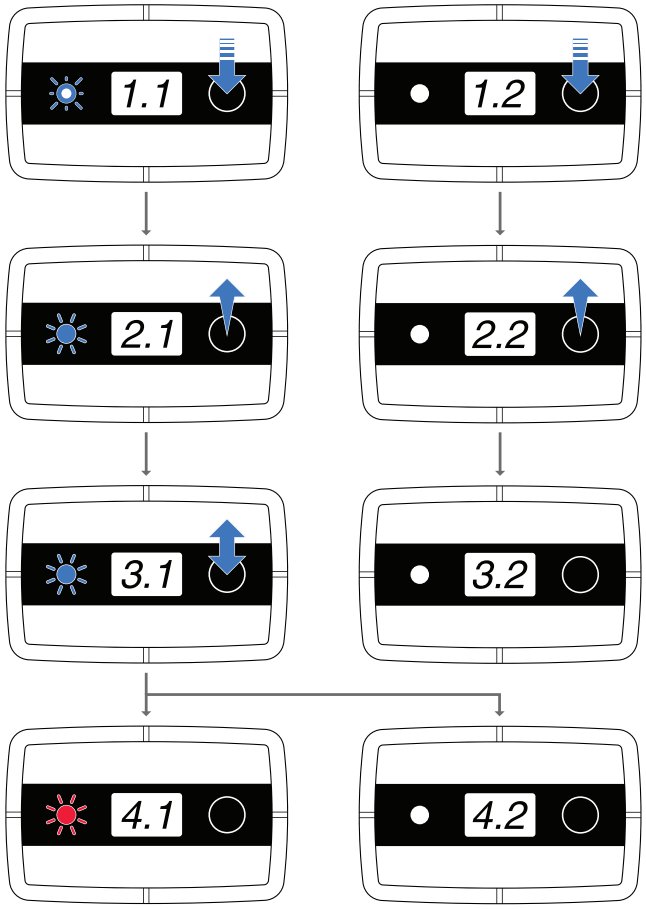
**2. After holding the button for 5 seconds the device will show:**

- **2.1 Blue (Illuminated):** Action required

**3. The user can now release the button and press and release within 5 seconds:**

**4. If the button isn't pressed & released within these 5 seconds:**

- **Red (Illuminated):** Deactivated
- **No LED:** Deactivation canceled




*Notes:*

- *Secured Configuration*
  - *If the device is in Secured Configuration it is not possible to deactivate the device using the button. The device will not react to a press and hold of the button and the LED will stay off. See diagram 1.2, 2.2 and 3.2 and "Communication Protocol" in Related Documents.*

# 6 Installation

## 6.1 Precautions

### WARNING

- Avoid placing wiring close to noise sources such as large motors or power supplies;
- To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter;
- Only connect the M12 connector to the Ratiometric Transmitter when there is no explosive atmosphere present;
- The equipment must be installed in accordance with EN 60079-14.
  - The DS-RT-02-XX and DS-PG-02-XX, or connected ratiometric sensor, must be individually connected to earth

## 6.2 Mounting Bracket Dimensions

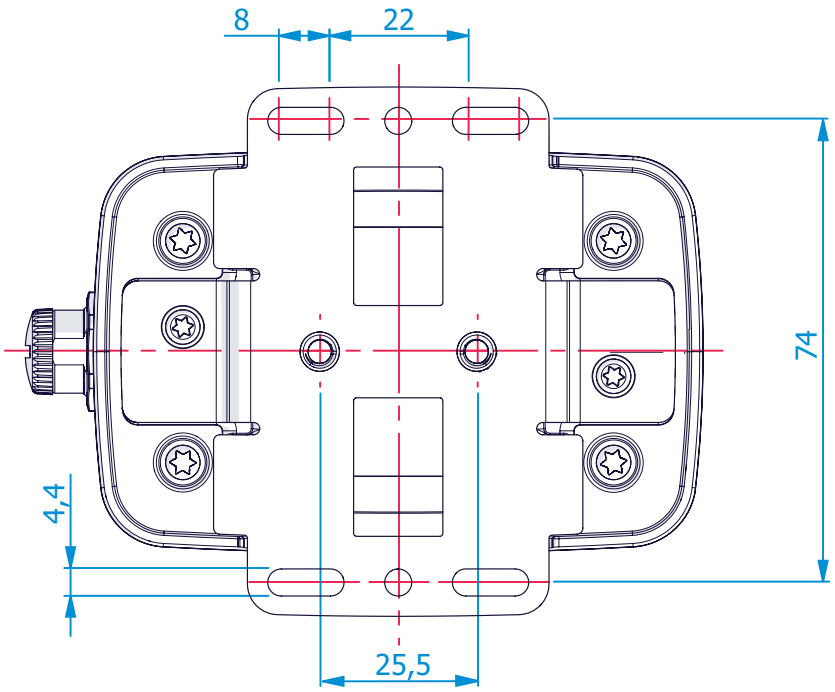



**Figure 10:** Product Dimensions (mm)

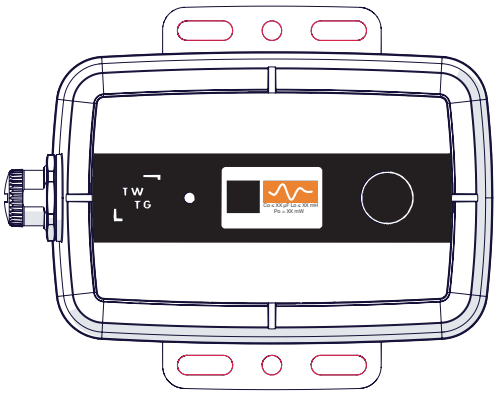
## 6.3 Installation Methods

### 6.3.1 Installation using mounting holes

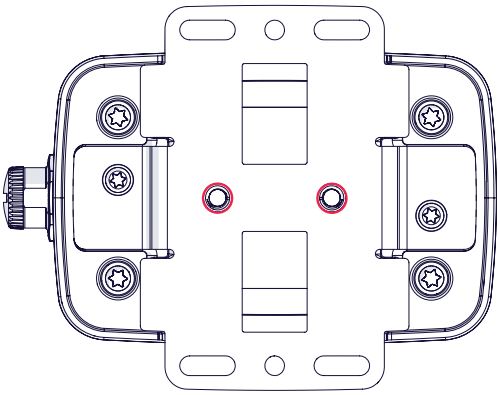
Place the bracket against the (flat) desired surface and use the screw holes or slots to fix in place.
Note: Slots and screw holes are designed for M4 fasteners.

### 6.3.2 Installation using threaded holes

Note: Threaded hole accepts M5 bolts.



**(a)** Mounting holes



**(b)** Threaded mounting holes

### 6.3.3 Installation using bandclamp

The Neon Ratiometric Transmitter can be mounted to a pole using a 14 mm wide band clamp, other sizes are not recommended.

**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 a plier;
4. Place the band clamp around the pole with the (adjustable) tightener and fix it in place.

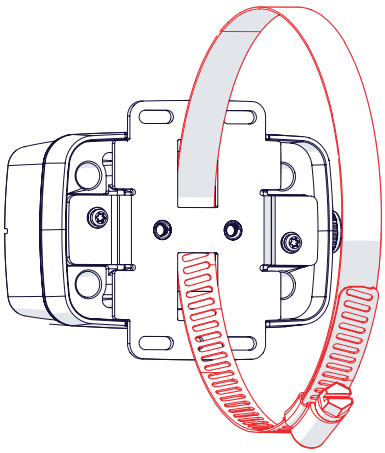


**Figure 12:** Installation using bandclamp

# 7 Product Functionalities

A detailled description of setting-up communication and configuring device settings can be found in "Communication protocol", refer to table 2. Related Documents.

## 7.1 Application Event Message

The Ratiometric Transmitter measures and reports the pressure either by set intervals (a timer-based trigger) or a condition-based trigger.

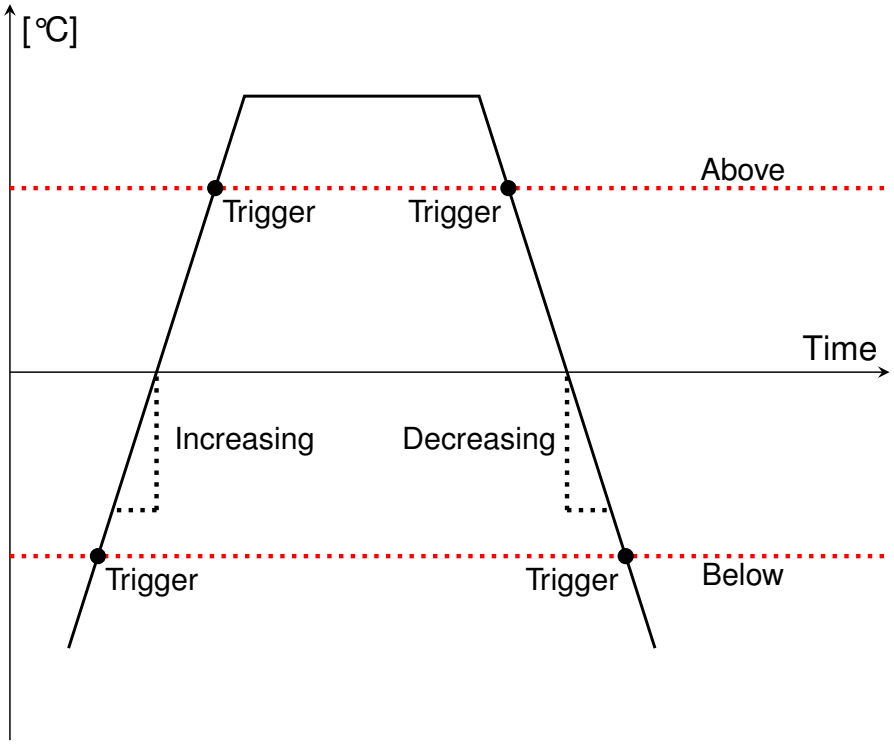



**Figure 13:** Application trigger event message

### 7.1.1 Event-triggers

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

- **Timer (periodic)**:
  The timer trigger is configurable through the following configurations:
  - *pressure_measurement_interval_seconds*
    Interval in seconds, at which the pressure sensor is read.
  - *periodic_event_message_interval*
    Interval in the number of measurements at which the application event messages are periodically sent. The periodic counter is reset on every event message.

- **Condition**:
  A condition-based trigger can be either of the following triggers:
  - *Above*
    If the maximum pressure is above the pressure_threshold then the condition is true. A transition of the condition from false to true or true to false will trigger an event message.

  - *Below*
    If the minimum pressure is below the pressure_threshold then the condition is true. A transition of the condition from false to true or true to false will trigger an event message.
  - *Increasing*
    The condition is true when the current pressure is at least pressure_threshold higher than the minimum pressure in the measurement_window (The maximum number of measurements to observe delta pressure to trigger an event). A transition of the condition from false to true or true to false will trigger an event message.
  - *Decreasing*
    The condition is true when the current pressure is at least pressure_threshold lower than the maximum pressure in the measurement_window (The maximum number of measurements to observe delta pressure to trigger an event). A transition of the condition from false to true or true to false will trigger an event message.

### 7.1.2 Content application event message

- **Pressure**
  The connected sensor pressure in units of 0-365.6 PSI (0-25 Bar):
  - Maximal;
  - Average;
  - Minimal.
- **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.

## 7.2 Device Status

Besides reporting the application pressure as outlined in, the Ratiometric Transmitter 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.

## 7.3 Default Configuration

The Ratiometric Transmitter is delivered with a default configuration. The default configuration includes:

- Measurement interval of 15 mins;
- Event-based message at the time of each periodic trigger with an interval of 15 measurements. (15 * 15 = 225 mins);
- 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.

# 8 Maintenance

## 8.1 Battery Specifications

| Specifications | |
|---|---|
| Manufacturer | Tadiran |
| Part number | Tadiran S1P1/SL-2780/323/TWT |
| Quantity | 1 |
| Battery Type / Size | Type D |
| Chemistry | Lithium Thionyl Chloride |
| Terminal Type | Standard |
| Dimensions | 61 x 32.5 mm |
| Battery Life | >5 years* |

**Table 7:** Battery Specifications

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

### 8.1.1 Battery Replacement

The battery can be replaced using the battery replacement kit. See Accessories and Spare Parts. This kit consists of the following parts:

- 1X Tadiran S1P1/SL-2780/323/TWT
- 4X O-Ring
- 1X Gasket

### 8.1.2 Required tools

- Torque screwdriver with TX10 bit;
  - See Assembly of Device for torque settings;
- ESD strap.

**IMPORTANT: ESD Sensitive Electronics**

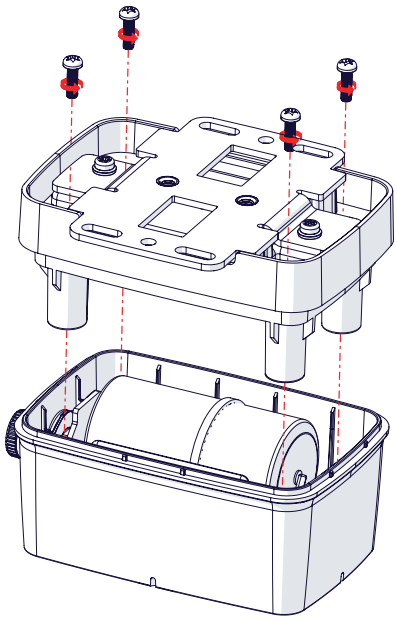
The product shall be installed in such a way that the risk for electrostatic discharges is minimised.

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

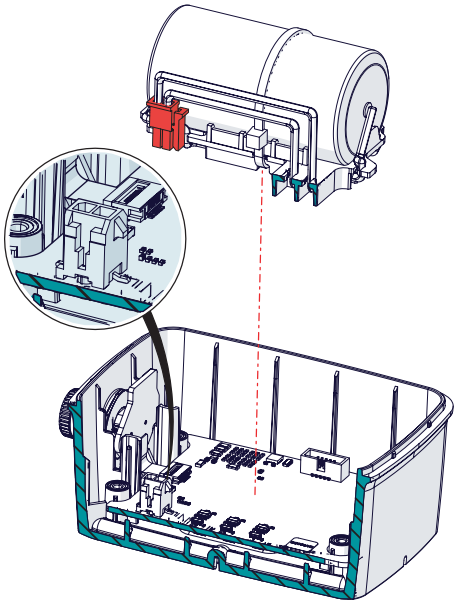
### 8.1.3 Disassembly of device

**WARNING - DO NOT OPEN WHEN AN EXPLOSIVE ATHMOSPHERE IS PRESENT**

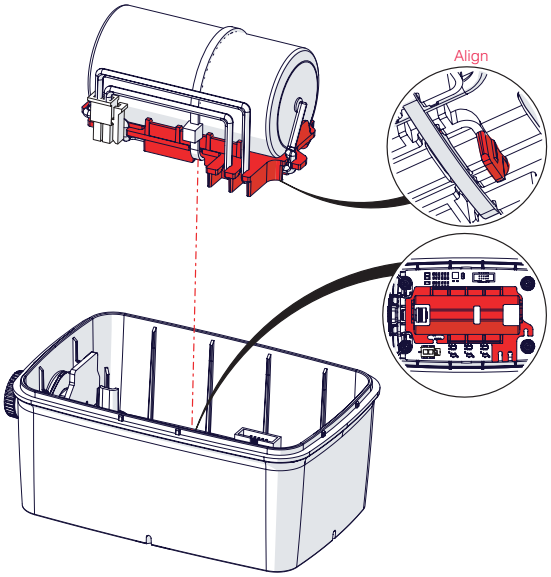
- This equipment shall only be opened by TWTG or by a competent instructed person;
  - The battery is serviceable by said persons;
  - Always disconnect M12 connector from Transmitter before replacing battery assembly



**Step 1:** Remove the four M3 screws and remove the bottom housing



**Step 2:** Before removing the battery assembly, disconnect the battery connector (marked in red)




**Step 3:** Place the new battery assembly using the rib on the battery cradle (marked in red) to align with designated cut-out in the top housing. Connect the new battery connector

### 8.1.4 Built-In Self-Test Procedure

When the device is deactivated a built-in self-test is performed upon insertion of the battery. This test is not executed when the device is already activated. Use the deactivation sequence as described in Device Deactivation and reinsert the batteries if a self-test is needed.

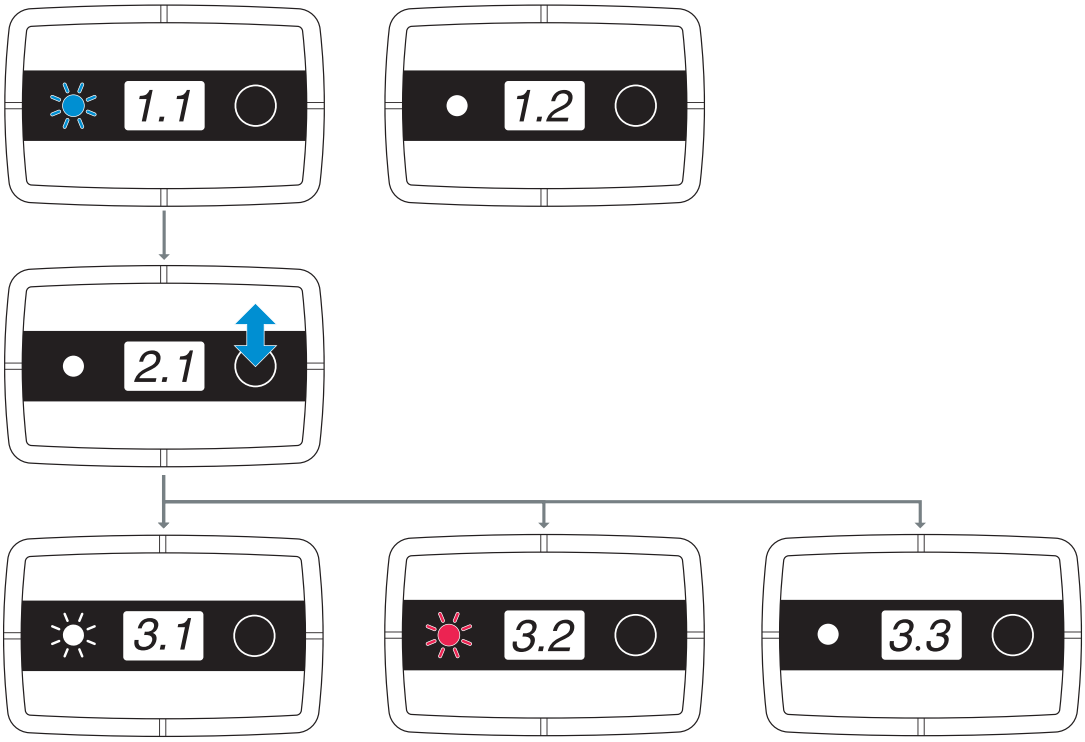



**Figure 14:** Built-in self-test

**1:** After successful replacement of the battery the device will go into self-test mode. This mode is activated for 30 seconds;

**1.1:** A BLUE LED will show after inserting the battery;

**1.2:** If no LED is shown, check the battery and / or device;

**2:** Start the test;

**2.1:** Press and Release the button;

**3:** Test Results;

**3.1:** LED turns bright WHITE for 5 seconds. Self test passed;

**3.2:** LED turns RED, self test failed. Check device;

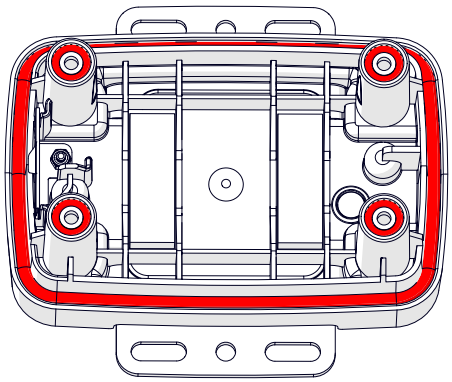
**3.3:** No LED, no response from device. Check device.

After pressing the button once and passing the self-test the device will exit the self-test mode. Pressing the button again will show the device status, as explained in Read device status.

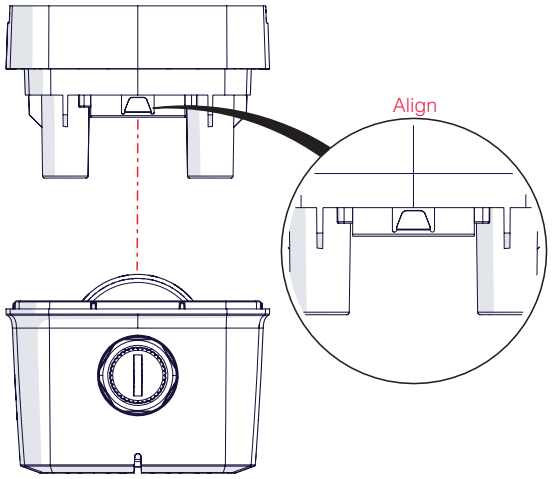
### 8.1.5 Assembly of Device

**IMPORTANT - USE THE SPECIFIED TORQUE SETTINGS**

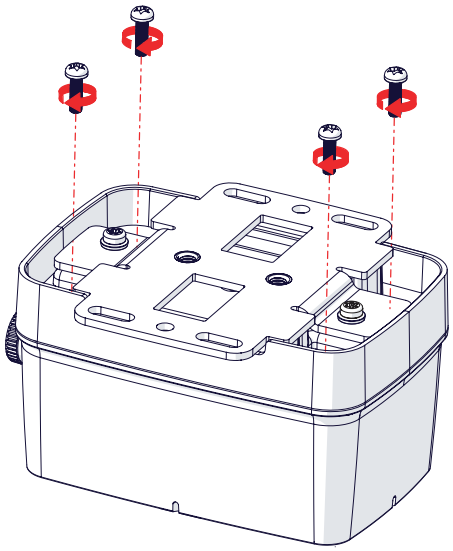
- Use a torque screwdriver to verify the applied torque;
- Failure to do so can result in water ingress;
- Improper assembly will void the warranty.



**Step 1:** Replace the 4 o-rings surrounding the screws and the gasket in the outer edge of the bottom housing




**Step 2:** Place the bottom housing back onto the top housing. For correct orientation; make sure that the bottom housing grounding plate is aligned with the top housing M12 connector



**Step 3:** Tighten the four M3 screws to fix the bottom housing. Use a torque screwdriver to set the maximum torque to 1 Nm

# 9 Accessories and Spare Parts

| Type | Order code | Description |
|---|---|---|
| Battery Replacement Kit | 5029_N02-09_Battery-Replacement-Kit | Including 1 battery assembly, 4 o-rings, 1 gasket |
| Magnet Kit Temporary Installation | 5030_DS-XX-02-XX_Magnet-Kit-Temporary-Installation | Including 2 magnets, 4 washers, 4 screws, installation manual |
| RT Sensor cable | DS-EC-02-AB03 | |

**Table 8:** Available Accessories & Spare Parts

| Manufacturer information | |
|---|---|
| Name | TWTG R&D BV |
| Address | Schaardijk 386<br>2909 LA Capelle a/d IJssel<br>The Netherlands |

# 10 EU Declaration of Conformity

This product complies with the following standards:

1. ATEX Directive (2014/34/EU):
    - EN 60079-0:2012 +A11:2013
    - EN 60079-0:2018
    - EN 60079-11:2012
2. Radio Equipment Directive (2014/53/EU):
    - EN 300 220-1 V3.1.1
    - EN 300 220-2 V3.2.1
    - EN 301 489-1 V2.2.3
    - EN 301 489-3 V2.1.1
    - EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
    - EN 62311:2020
    - EN 60529:1991 + A1:2000 + A2:2013
3. WEEE Directive 2003/1008/EC
4. RoHS (2011/65/EU)

For the full Declaration of Conformity see:

*www.twtg.io/legal*

# 11 UK Declaration of Conformity

This product complies with the following standards:

1. ATEX Directive (2014/34/EU):
   (a) EN 60079-0:2012 +A11:2013
   (b) EN 60079-0:2018
   (c) EN 60079-11:2012
2. Radio Equipment Regulation 2017:
   (a) EN 300 220-1 v3.1.1
   (b) EN 300 220-2 v3.2.1
   (c) EN 301 489-1 v2.2.3
   (d) EN 301 489-3 v2.1.1
   (e) EN 62311:2020
   (f) EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
   (g) EN 60529:1991 + A1:2000 + A2:2013
3. WEEE Directive 2003/108/EC
4. RoHS (2012/19/EU)

For the full Declaration of Conformity see:

*www.twtg.io/legal*

# 12 FCC and ISED Declarations

This device complies with part 15 of the FCC Rules and to RSS of Industry Canada. 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. 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.

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.

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de Classe B est conforme à la norme Canadienne ICES-003.
CAN ICES-003(B) / NMB-003(B)