Report for Test of Conformance to LoRaWAN™ V1.0.2
for the Device
“Teneo Filling Level Sensor”
for the Customer
“Teneo IoT B.V.”

Jens Lerner
Yavuz Turan

21st May, 2021
Administrative Summary

Location: IMST GmbH, Test Centre, Kamp-Lintfort, Germany
Responsible Test Engineer: Yavuz Turan, Jens Lerner

Subject: Test of Conformance to LoRaWAN™ Specification V1.0.2

Company and Contact Information:
Teneo IoT B.V.
Inou Heideman
Landbouwstraat 5-06
7101 EK Winterswijk
Netherlands

Tested Device: Teneo Filling Level Sensor
Hardware version: id1987984_D
Firmware version: V1.12 (commit: 22f5b29dc1)
End-device identifier: TBV-01DST-01LR
LoRa Device Class: A
LoRaWAN Specification version: V1.0.2
Certification requirements: LoRa End Device Certification EU Version 1.6
Frequency band(s) tested: 868 MHz
Test Equipment: Test Software Version: 1.1.16
IMST LGW (iC880A + Raspberry Pi): Gateway software version 5.0.1
Packet forwarder software version 4.0.1

Test Result: PASS

Quality Engineer: Jens Lerner
Date: May 21st, 2021

The Test Report, No. 6210387 has the following conclusion:

The device has PASSED the tests hereunder.

Responsibility: Yavuz Turan
Approved: Jens Lerner
Test Engineer
Quality Engineer

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1 Description of the Device Under Test (DUT)

1.1 General

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name</td>
<td>Teneo Filling Level Sensor</td>
</tr>
<tr>
<td>Product Vertical(s)</td>
<td>Cities</td>
</tr>
<tr>
<td>Series (if any)</td>
<td></td>
</tr>
<tr>
<td>Hardware Version</td>
<td>id1987984_D</td>
</tr>
<tr>
<td>Firmware Version</td>
<td>V1.12 (commit: 22f5b29dc1)</td>
</tr>
<tr>
<td>Type of DUT</td>
<td>☑ Module ☐ End Device/Sensor ☐ others</td>
</tr>
<tr>
<td>Geographical area of operation</td>
<td>☑ Europe ☐ USA</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>☑ 433 MHz ☑ 868 MHz ☐ 915 MHz</td>
</tr>
<tr>
<td>Adaptive Data Rate (ADR) supported?</td>
<td>☑ Yes ☐ No</td>
</tr>
<tr>
<td>Optional data rates supported?</td>
<td>☑ DR6 ☑ DR7</td>
</tr>
<tr>
<td>Activation possibilities</td>
<td>☑ Over the air ☐ by personalization ☐ both</td>
</tr>
<tr>
<td>Test According LoRaWAN™ Spec</td>
<td>☑ V1.0.1 ☑ V1.0.2</td>
</tr>
<tr>
<td>Output Power</td>
<td>14 dBm</td>
</tr>
<tr>
<td>Number / Type of Antenna(s)</td>
<td>1/ PCB antenna</td>
</tr>
<tr>
<td>Antenna Gain</td>
<td>-7.3 dBi</td>
</tr>
</tbody>
</table>

**Table 1 Device Information**

1.2 DUT Modes of Operation

During the tests the device operated in the following modes:

- Test mode according to document “LoRa Alliance End Device certification Requirements for EU863-870 MHz Version 1.6” Chapter 2.

1.3 DUT Setup

![DUT Setup Image](image)

**Figure 1 DUT Setup**
Applied Methods of Measurement

1.4 Protocol Testing according to LoRaWAN™ specification V1.0.2

Detailed Test Results:

Device Activation (Activation by Personalization): PASS
Test Mode Activation (Over the Air Activation): PASS
Test Application Functionality: PASS
New Channel Request: PASS
Channel Plan Usage: PASS
Cryptography: PASS
Packet Error Rate RX2 SF12: PASS
Downlink Window Timing: PASS
Frame Sequence Number: PASS
Confirmed Packets: PASS
Device Status Request: PASS
Dis Channel Request Mac Command: PASS
RX Parameter Setup Request: PASS
RX Timing Setup Request: PASS
TX Parameter Setup Request: PASS
Link Check Request: PASS
Link ADR Request: PASS
Uplink Datarate RX1 DR Offset Mapping: PASS
Packet Error Rate Rx1 MaxSize: PASS
RX1 And RX2 Simultaneous Frames: PASS
RX Oversized Payload: PASS
Maximum Allowed Payload: PASS
Mac Commands: PASS
Device Deactivation: PASS

Supported Optional Features:

Adaptive Data Rate (ADR): Yes
DR6 (SF7BW250): Yes
DR7 (FSK50): No
Link ADR Request Block: No
Dis Channel Request: Yes
Range 6dB: Yes
Join Synch DevNonce: No
Confirmed Re-transmissions: Yes (Max retries 7)

Remarks: None

Result: The device passed the test without limitations.