The Testcenter facility ‘LoRa® Test Lab’ within IMST GmbH is recognized by the LoRa™ Alliance for testing in accordance to the LoRaWAN™ Specification V1.0.1

Report for Test of Conformance to LoRaWAN™ V1.0.1
for the Device
“Klax"

for the Customer
“comtac AG”

Markus Ridder
Yavuz Turan

11. Mar. 2019
Administrative Summary

Location: IMST GmbH, Test Centre, Kamp-Lintfort, Germany
Responsible Test Engineer: Yavuz Turan, Markus Ridder

Subject: Test of Conformance to LoRaWAN™ Specification V1.0.1

Company and Contact Information:
comtac AG
Mr. Andres Ramirez
Allenwindenstrasse 1, 8247 Flurlingen
Switzerland
Tested Device: Klax
Firmware version: V00.03.0000
Hardware version: REV02
LoRa Device Class: A
LoRaWAN Specification version: V1.0.1
Certification requirements: LoRa End Device Certification EU Version 1.5
Frequency band(s) tested: 868 MHz
Test Equipment: Test Software Version: 1.1.11
Semtech IOT SX1301 Starter Kit: Gateway software version 3.1.0
Packet forwarder software version 2.1.0

Test Result: PASS

Chief Test Engineer: Markus Ridder
Dept. Test Center

Date: March 11th, 2019

The Test Report, No. 6190355 has the following conclusion:

The device has PASSED the tests hereunder.

Responsibility: Yavuz Turan
Approved: Markus Ridder
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>Klax</td>
</tr>
<tr>
<td>Kind of product</td>
<td>IR-Head Metering</td>
</tr>
<tr>
<td>Series (if any)</td>
<td></td>
</tr>
<tr>
<td>Hardware Version</td>
<td>REV02</td>
</tr>
<tr>
<td>Firmware Version</td>
<td>V00.03.0000</td>
</tr>
<tr>
<td>Type of DUT</td>
<td>Module / End Device</td>
</tr>
<tr>
<td>Geographical area of operation</td>
<td>Europe</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>Up to 25 mW</td>
</tr>
<tr>
<td>Number / Type of Antenna(s)</td>
<td>1 / Fractus Chip Antenna</td>
</tr>
<tr>
<td>Antenna Gain</td>
<td>2dBi</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 End Device Certification EU V1.5” Chapter 3.

1.3 DUT Setup

![Figure 1 DUT Setup](image-url)
Applied Methods of Measurement

1.4 Protocol Testing according to LoRaWAN™ specification V1.0.1

Detailed Test Results:

Test Mode Activation (Over the Air Activation): **PASS**
Test Application Functionality: **PASS**
Packet Error Rate RX2 SF12: **PASS**
Cryptography: **PASS**
Downlink Window Timing: **PASS**
Frame Sequence Number: **PASS**
Device Status Request: **PASS**
Mac Commands: **PASS**
New Channel Request: **PASS**
Confirmed packets: **PASS**
RX Parameter Setup Request: **PASS**
RX Timing Setup Request: **PASS**
Link ADR Request: **PASS**
Packet Error Rate RX1 Window: **PASS**
Packet Error Rate RX2 Window: **PASS**

Supported Optional Features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Data Rate (ADR)</td>
<td>Yes</td>
</tr>
<tr>
<td>DR6 (SF7BW250)</td>
<td>Yes</td>
</tr>
<tr>
<td>DR7 (FSK50)</td>
<td>Yes</td>
</tr>
<tr>
<td>Link ADR Request Block</td>
<td>No</td>
</tr>
<tr>
<td>Di Channel Request</td>
<td>No</td>
</tr>
<tr>
<td>Range 6 dB</td>
<td>No</td>
</tr>
</tbody>
</table>

Remarks: None.

Result: The device passed the test without limitations.