

SENSOTERRA

Moisture Data Integration Guide



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Table of contents

Introduction	3
Overview	3
Data from private LoRaWAN networks	4
Customer API	5
Documentation	5
Security	6
Encryption	6
Authentication	7
Authorization	7
Server push notifications	8
Format	8
Customer endpoint	10
Testing	10
Expiration	10
Hosting locations of Sensoterra data	11

Introduction

This document describes how you can integrate Sensoterra soil moisture data from the Sensoterra backend into your own environment. This can be as simple as downloading an Excel file with all soil moisture data up to using the Sensoterra Customer API and push notifications to fully control your own and/or your customers' sensors.

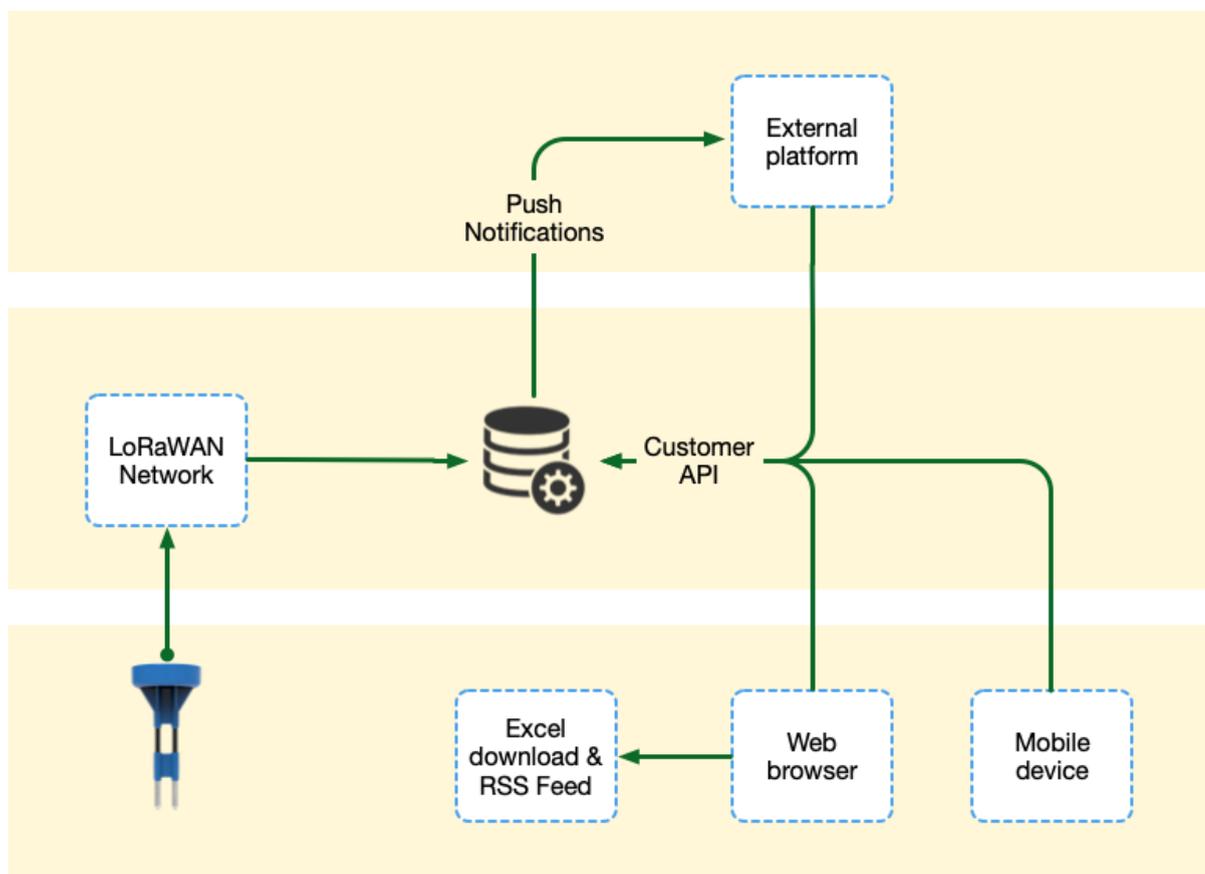
Intended audience are Sensoterra customers and resellers who want to integrate the Sensoterra sensors into their own platforms, applications and dashboards.

This document describes the methods how to get data from the Sensoterra backend via the following methods:

- Using the Sensoterra Customer API (REST)
- Using the Sensoterra Push Notifications

Please note that the payloads from Sensoterra sensors cannot be directly used. The payloads need to be decoded and calibrated by the Sensoterra backend.

Overview



Data flow is as follows:

- Sensor measurements are forwarded by the LoRaWAN network to the Sensoterra backend.
- All sensor data is decoded and calibrated by the Sensoterra backend and stored in a central database operated by Sensoterra.
- Sensor measurements and configuration are accessible through the Customer API. This API is also used by the Sensoterra Android & iOS apps and by the web site <https://monitor.sensoterra.com>.
 - Measurements can be downloaded from the monitor website as an Excel file. A GeoRSS feed is also offered with all the latest sensor data.
 - Exceptions like soil too dry/wet can be sent by mail or pushed directly to your mobile device.
- ***Measurements can be pushed in real time into an external platform. This is strongly preferred over polling the API, because it is less demanding for both your environment as the Sensoterra environment.***

Data from private LoRaWAN networks

If the LoRaWAN connectivity is not managed by Sensoterra or its partners, but by the customer and/or a third-party supplier, please consult our *Custom LoRaWAN Integration Guide* on how to link the Sensoterra sensors to the LoRaWAN network and get the payloads decoded by the Sensoterra backend.

Customer API

The API is intended for external platform integration. With this API, the sensor data can be retrieved, (customer) accounts can be managed and sensor settings can be changed.

This API is a RESTful webservice using JSON as the message format. The API can be used for various management tasks like:

- Get all sensor data
- (Customer) account creation
- Sensor registration
- Change calibration settings
- Sensor location management
- etc.

For retrieving data, we strongly advise to use Push Notifications instead of polling through the Customer API.

Documentation

The customer API documentation can be found at <https://monitor.sensoterra.com/api/v3/>. To test drive the API, the documentation can be used. Preparation:

1. Create an account in the Sensoterra app (can be done in the [API](#) too).
2. Get a temporary API key in the API
3. Authorize the API with this key

To get a temporary API key, use the [Customer Auth PUT](#) call, click on “Try it out” and fill in your credentials:

customer ▾

PUT /customer/auth Get an API key based the user credentials

When the API key expires you have to renew it. Keys expire typically after 30 minutes.

Parameters Cancel

Name	Description
body * required (body)	Customer object with login credentials.
	Example Value Model <pre>{ "email": "joe@somewhere.org", "password": "my_secret" }</pre>

Press “Execute” to get the key:

The screenshot shows a REST client interface with the following details:

- Execute** button (highlighted in blue) and **Clear** button.
- Responses** section with a dropdown menu set to **application/json**.
- Curl** section containing the command:


```
curl -X PUT "https://monitor.sensoterra.com/api/v2/customer/auth" -H "accept: application/json" -H "language: en" -H "Content-Type: application/json" -d '{"email": "mark.ruys@sensoterra.com", "password": "XXXXXXXXXX"}'
```
- Server response** section showing a **Code** of **200** and **Details**.
- Response body** section containing the following JSON:


```
{
  "api_key": "522a5f422d9436c5ae9c94087e568e16f2323c95fde557ab1ece79d2237cee08|39|1510318233",
  "notifications_email": "OFF",
  "notifications_app": "ON",
  "role": "CUSTOMER",
  "email": "mark.ruys@sensoterra.com",
  "disclaimer_agreed": "YES"
}
```

Click on "Authorize" to paste in the API key.

The screenshot shows the Sensoterra Customer API documentation page with the following content:

- Sensoterra Customer API** (version 1.2.0)
- Base URL: monitor.sensoterra.com/api/v2
- Documentation link: <https://monitor.sensoterra.com/api/v2/sensoterra-api.yaml.php>
- Description: The Sensoterra API for customer applications
- Links: [Sensoterra Tech Team - Website](#), [Send email to Sensoterra Tech Team](#)
- Label: Proprietary
- Schemes** dropdown menu set to **HTTPS**
- Authorize** button with a lock icon

From now on, all API calls are performed in the selected account.

Security

Although the API does not reveal privacy sensitive data, it does contain sensitive business data as the geolocation of sensors, soil type, and historical soil moisture data. Therefore, the API is protected through a series of security measures.

Encryption

All communication to the servers providing the API is encrypted by TLS. Qualys Labs rates the encryption at the highest [A+ level](#).

Authentication

The Sensoterra Customer API is protected by dynamic token authentication. To get access to the API the user requests a security token by handing over its username (typically email address) and password. After the credentials are verified, the customer receives a token. For each API request, the user must add the token. A token has a limited lifetime of 30 minutes.

Authorization

The API provides three different access levels:

1. Customers
2. Resellers
3. Partners

A customer only has access to their own data. A value-added reseller has access to all data of all their customers. A partner is a reseller with read only access.

Server push notifications

As a value-added reseller or individual customer, you can have your decoded and calibrated sensor measurements forwarded in real time to your own platform by the Sensoterra backend. To be able to receive these Push Notifications, it is necessary to create an endpoint in your environment, to receive each sensor reading processed by Sensoterra. The end point will be called using a http(s) POST call containing a JSON payload.

Server push notifications use the standardized SenML format. As value-added reseller or individual customer, you set up an endpoint to which the SenML measurements are sent from the Sensoterra backend.

Format

Measurements adhere to the formal SenML specifications. We use JSON as the message format. An example of a version 4 payload of two soil measurements at 3:17pm and 2:17pm is:

```
[
  {
    "bver": 4, "bn": "urn:dev:mac:0024beffffe804ff0_18000125819",
    "u": "rssi", "v": -116,
    "bt": 1505747862
  },
  { "u": "lat", "v": 52.5495116 },
  { "u": "lon", "v": 5.6128824 },
  { "u": "%EL", "v": 100 },
  { "u": "%vol", "v": 32.3, "depth": 30, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.0, "depth": 30, "soil": "SAND", "ut": 5400, "t": -3600 },
]
```

This encodes the following measurements:

- For version 4 payloads: sensor serial number is 18000125819 and DevEUI 0024beffffe804ff0¹
- At 18 September 2017 15:17:42 (basetime 1505747862) we have:
 - Radio signal strength (RSSI) of -116 dBm
 - Geolocation sensor of 52.5495116, 5.6128824
 - Soil moisture in sand of 32.3% at a depth of 30 cm
 - We expect the next value within an hour and a half
- At 18 September 2017 14:17:42 (time -3600) we have:
 - Soil moisture in sand of 32.0% at a depth of 30cm

¹ Customers created before 2021-04-1 are using version 3 payloads by default. In that case the “bn” field will have only the serial number as basename, like “urn:dev:com.sensoterra:18000125819”. Please contact support if you want to switch to version 4 payloads.

An example of a multi depth reading is:

```
[
  {
    "bver": 4, "bn": "urn:dev:mac:0024befffe804ff1_24000125828",
    "u": "rssi", "v": -116,
    "bt": 1505747862
  },
  { "u": "lat", "v": 52.5495116 },
  { "u": "lon", "v": 5.6128824 },
  { "u": "%EL", "v": 100 },
  { "u": "%vol", "v": 32.3, "depth": 10, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.0, "depth": 20, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 30.0, "depth": 30, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 28.0, "depth": 45, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.1, "depth": 60, "soil": "CLAY", "ut": 5400 },
  { "u": "%vol", "v": 32.9, "depth": 90, "soil": "CLAY", "ut": 5400 },
  { "u": "Cel", "v": 16.9, "depth": 15 }
]
```

Notes:

- Part of the Base Name (“bn”) is the sensor serial number (as seen on the QR code label).
- The basetime (“bt”) is in Unix timestamps from 1970-1-1 in UTC and contains the date/time of the measurement.
- The following sensor values are supported (depending on the sensor model):

<i>Unit</i>	<i>Meaning</i>
%vol	Soil moisture content at a certain depth/soil type
Cel	Temperature in degree Celsius at a certain depth
%EL	Battery energy level based on voltage (0% = empty, 100% = full)
lat	Sensor latitude
lon	Sensor longitude
rssi	Radio signal strength, higher is better
esp	Estimated signal power, higher is better

For more details on SenML, please check <https://tools.ietf.org/html/draft-ietf-core-senml-10>.

Customer endpoint

When you have created an endpoint to get the sensor measurements delivered from the Sensoterra backend, please contact support@sensoterra.com in order to activate forwarding to this endpoint.

*Typically, an endpoint will be some web service which accepts POST data. The content type is **application/senml+json**.*

Basic authentication or an optional header can be configured at request.

Testing

For testing, Sensoterra can set up a mail forward of SenML data to the customer. Please contact support@sensoterra.com to set it up.

Expiration

If a notification delivery times out, the measurements will be offered again to the end point, until the delivery succeeds, or after 35 hours when the measurements expire.

Hosting locations of Sensoterra data

Sensoterra production servers are spread over data centers in Amsterdam, the Netherlands, and Frankfurt, Germany. These data centers are operated by TelecityGroup and Interxion respectively and ISO/IEC 27001:2013 and PCI-DSS certified.