



Fracsun Inbound API Documentation

June 14, 2022 Revision A

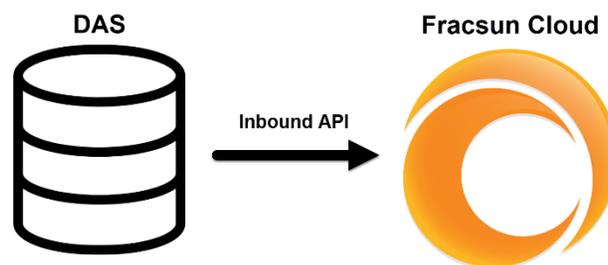
1.0 Introduction

This document discusses how to send/upload soiling sensor data to the Fracsun Cloud using the RESTful **Inbound API**. This is particularly useful for customers who prefer to externally connect Fracsun's soiling monitoring device to dataloggers or SCADA systems, but want to view soiling sensor data and use the analytical tools available on the Fracsun Web Portal.

1.1 ARES Cellular and Modbus modes

In the default state, ARES is an IoT cellular-enabled device that automatically connects to the nearest cellular base station and outputs data to the Fracsun cloud. The customer can view the data on Fracsun Dashboard. The Fracsun Cloud also performs additional data processing. For example, the *daily* soiling loss and insolation values are calculated (filtered and weighted) as a cloud process. This effectively cleans up the noise from the raw data to help visualize clear trends in soiling.

ARES can also operate in Modbus-only mode for wired connections to dataloggers and SCADA systems, which is most likely the preferred connection method for customers reading this document. The cellular modem is turned off in this mode, which stops the flow of data to the Fracsun Cloud. This also means that the daily calculated data (daily soiling loss, insolation, and Wash Analysis) can no longer occur in Modbus-only mode because the Fracsun cloud process cannot run without the data.



1.2 Integrating with a DAS

In order to effectively interface Fracsun's entire soiling solution with the data acquisition system (DAS), a customized integration must be developed to transfer raw data (irradiance, temperature, and soiling) from the DAS to the Fracsun cloud database.

Once the raw data is available for consumption on the Fracsun Cloud, the customer can view the sensor data and run the Wash Analysis on the Fracsun Dashboard. The Fracsun Cloud will also calculate the daily data (soiling loss, insolation), automatically run the Wash Analysis daily, and send soiling alerts/reports to the customer.

2.0 Getting Started

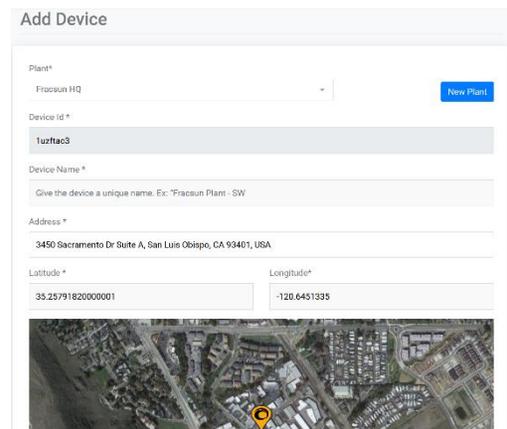
2.1 Adding a new Inbound API Device

To send sensor data to the Fracsun Cloud, an “Inbound API Device” must be created in the Fracsun Portal. To create a new Inbound API Device, perform the following steps:

1. Go to your Fracsun Dashboard: <https://portal.fracsun.com/>
2. Go to the “Device Data” page.
3. Click on the “Add Inbound API Device” button.

 + Add Inbound API Device

4. Fill in the form details about the device.
 - a. Give the device a unique name.
 - b. Create a New Plant if necessary. It’s important to provide accurate GPS coordinates about the plant because historical weather data will be tied to the plant location.
 - c. Add the specific GPS coordinates (if known) where the soiling sensor is located at the plant.
 - d. Enter the soiling sensor’s installation date.
 - e. Enter the soiling threshold at which you want to receive alerts.



Once the device has been created, sensor data can start being pushed to the Fracsun Cloud.

2.2 Inbound API Key

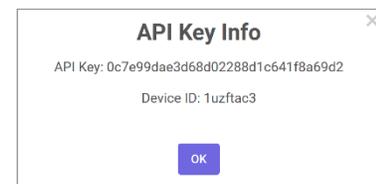
An Inbound API key is required to push sensor data to the Fracsun Cloud. This unique key must be added in the request body of the PUT request. Inbound API Keys are only available for Inbound API Devices, so verify you have created an Inbound API Device or already have one in your Device list on the Fracsun Portal.

Only *Inbound API Keys* can push sensor data to the Fracsun Cloud. Do not confuse this with *Outbound API Keys*, which are intended for pulling sensor data from the Fracsun Cloud to a DAS.

To view the Inbound API key, perform the following steps:

1. Go to your Fracsun Dashboard: <https://portal.fracsun.com/>
2. Go to the “Device Data” page.
3. Locate the Inbound API Device in the list and click on the “API Key” button. The Inbound API Key is visible in the popup.

 API Key



2.3 Device ID

A Device ID is also required to push sensor data to the Fracsun Cloud. This ID must be added in the request body of the PUT request. Device IDs are 8 characters long and specific to Inbound API Devices. The Device ID identifies the soiling sensor on the Fracsun Portal and is what all data and configuration information is tied to.

To view the Device ID, perform the following steps:

1. Go to your Fracsun Dashboard: <https://portal.fracsun.com/>
2. Go to the “Device Data” page.
3. Locate the Inbound API Device in the list and click on the “View API Key” button. The Device ID is visible in the popup.

2.4 Rate Limiting

In general, the number of API requests should be kept to a minimum. Fracsun’s Inbound API was designed to send bulk sets of data for each request. Fracsun’s Inbound API was *not* designed for constant API requests less than a minute apart. One should not send over soiling sensor data every second.

The following rate limits are:

- 30 calls per minute
- 120 calls per day

2.5 Maximum data per request

The maximum number of datapoints you may send in one request is: **10080**.

This is equal to 1 minute resolution data during a 24 hour period, or 2 minute resolution data during a 48 hour period.

2.5 Errors

400	Bad request. Possible reasons: <ul style="list-style-type: none">• Malformed request parameters• Missing request parameters• Invalid JSON data provided
401	Unauthorized. Possible reasons: <ul style="list-style-type: none">• Basic Authentication failed• No Inbound API key was provided• Invalid Inbound API key provided
404	Endpoint not found. Possible reasons: <ul style="list-style-type: none">• URL endpoint is wrong• No Device ID provided• Invalid Device ID provided
405	Method not allowed (See the returned <code>Allow</code> header for the set of methods supported by the resource)
429	Too many requests (the rate limit was exceeded)

3.0 Endpoints

3.1 Put sensor data

PUT /api/device/inbound/data

Query Parameters

None

Request Headers

Name	Type	Description
Content-Type	required application/json	

Request Body

Soiling sensor data object

Property	Type	Description
apiKey	required String	The Inbound API key
deviceID	required String	The Device ID associated with the Inbound API key
iC	required Integer	Irradiance (clean) in W/m2
iD	required Integer	Irradiance (dirty/soiled) in W/m2
sl	Float	Soiling Loss (%)
sr	Float	Soiling Ratio
tC	Float	Temperature (clean) in C
tD	Float	Temperature (dirty/soiled) in C
tE	Float	Temperature (enclosure) in C
tS	required String	ISO 8601 timestamp in UTC (not timezone adjusted)

The *soiling sensor data object* must be in the exact format as seen in the example below. Inside this object is the data field, which must be an array of data objects. The data objects must include the required fields (iC, iD, and tS).

The timestamp (tS) must be in ISO 8601 format and be the UTC time (not timezone adjusted). The timestamp format should look like this: 2022-05-22T22:00:00.000Z

Example Request

```
curl -i -X PUT \
  -H "Content-Type:application/json" \
  -d \
  '{
    "apiKey":"m6pQE9DTXx6EAzvebGsQ",
    "deviceId":"4jA9uzVu",
    "data":[
      {
        "iC": 1000,
        "iD": 900,
        "sI": 10.00,
        "sr": 0.90,
        "tC": 19.08,
        "tD": 19.08,
        "tE": 18.25,
        "ts": "2022-05-22T22:00:00.000Z"
      },
      {
        "iC": 999,
        "iD": 899,
        "sI": 10.00,
        "sr": 0.899,
        "tC": 19.09,
        "tD": 19.09,
        "tE": 18.41,
        "ts": "2022-05-22T22:05:00.000Z"
      },
      {
        "iC": 998,
        "iD": 898,
        "sI": 10.00,
        "sr": 0.899,
        "tC": 19.07,
        "tD": 19.07,
        "tE": 18.41,
        "ts": "2022-05-22T22:10:00.000Z"
      }
    ]
  }' \
  'https://admin.fracsun.com/api/device/inbound/data'
```



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