



EXACT PRO SENSOR USER MANUAL

EXACT SENSOR SPECIFICATIONS

Type of stoves: all

Maximum number of logs: 131,000

Measurement frequency: 1 minute

Log frequency: 1-32 minute

Battery life: 4+ years of usage (8 years of self-life)

Measurement technology: Thermistor

Launch and data transfer: Launcher / Bluetooth Low Energy

Protection: Sensor are completely water and dust proof.

Temperature Rating: 125 C

Weight: 16g

Dimension: 56x26x12mm

INTRODUCTION

The EXACT Sensor has been designed from the ground up to be an **EX**tremely **A**ccessible **C**ookstove **T**racking System. Each sensor is small and rugged (water and dust proof).

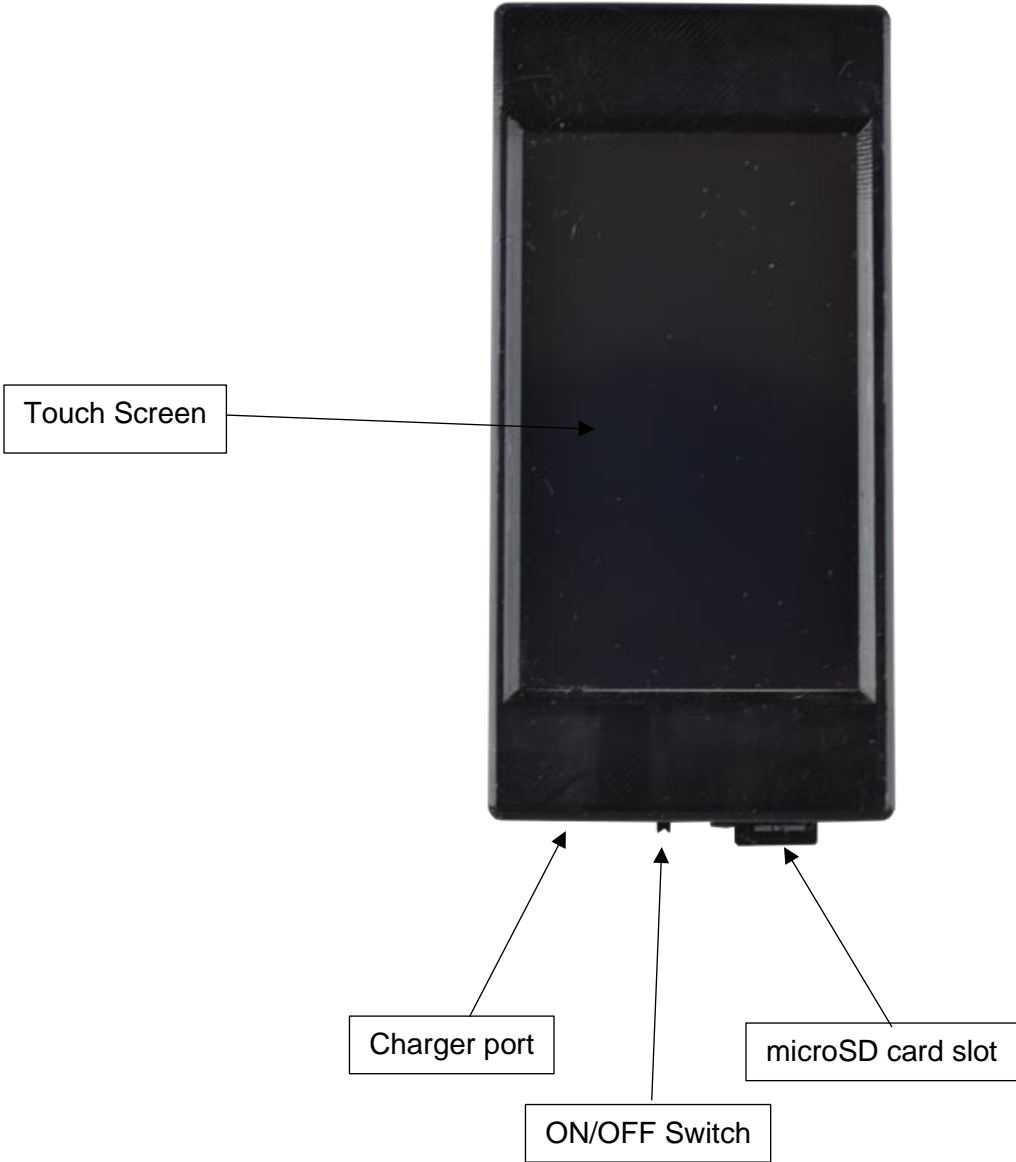
The data from the sensor can be collected using a handheld launcher that is used to start and stop the sensors. This launcher communicates wirelessly with the sensor. Our SensorHub Android app can also directly upload key cooking metrics to our cloud platform.



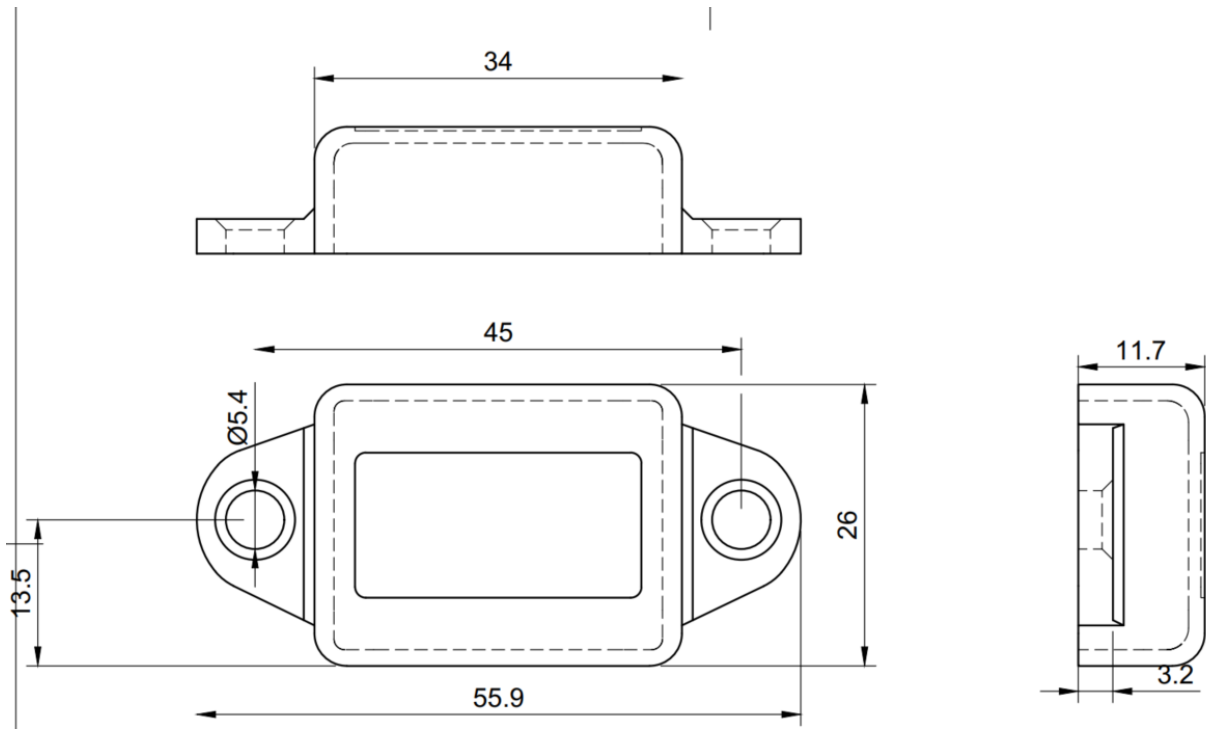
While our sensors can measure and log temperature like most SUMS loggers do, their real added value is that they can also directly detect and log whether the stove is being used or not. The EXACT sensors count cooking events and measure cooking time on-the-fly.

The sensor internal algorithm is based on insights collected on dozens of large-scale deployments and features our unique heat-flux detection method.

LAUNCHER DESCRIPTION



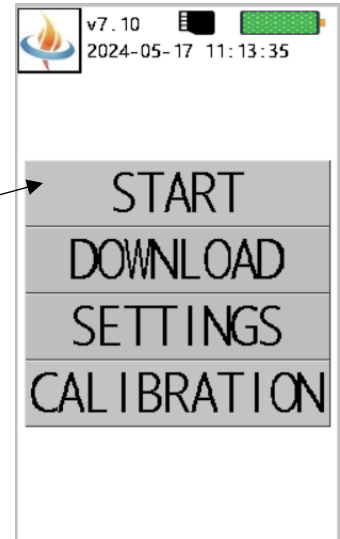
SENSOR DESCRIPTION



LAUNCHING THE SENSORS IN A NEW HOUSEHOLD

- Press the START button on the launcher. This will scan for all the sensors in the surroundings.

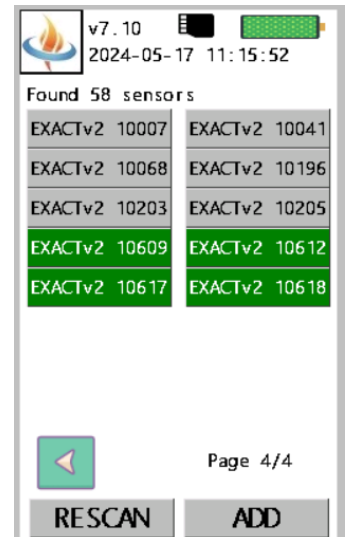
Press "START"



N.B: If you are carrying a lot of sensors with you, you should keep the unused sensors in a different location.

- Select then the sensors you want to add to this household. When selected, they turn green. Once you have selected all the sensors you need, press ADD

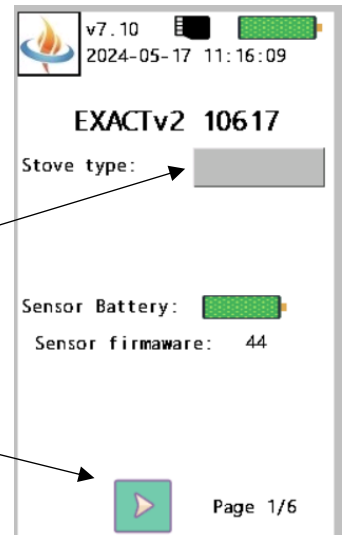
N.B: the launcher can list up to 128 sensors. If there are more than 128 sensors around, they will not be all listed. Keep the sensors you don't want to launch far away from the launcher.



- For each sensor selected, select the stove on which they will be placed. A predefined list of 16 stove names is available (this list is customizable, see below).

Press here to select stove type

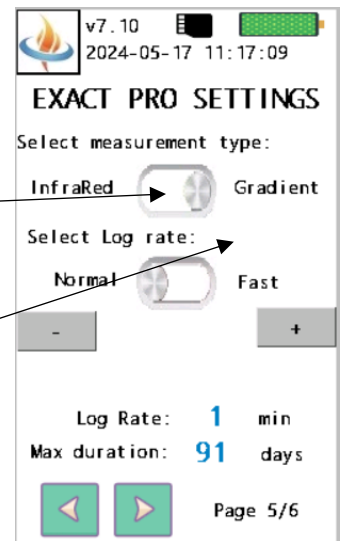
Press here to navigate between sensors



- Current Version of EXACT Pro only have the Gradient option.
- Select then the log rate, this will determine how long the mission can last before the memory is full, make sure to leave some room here.

Select the type of data logged

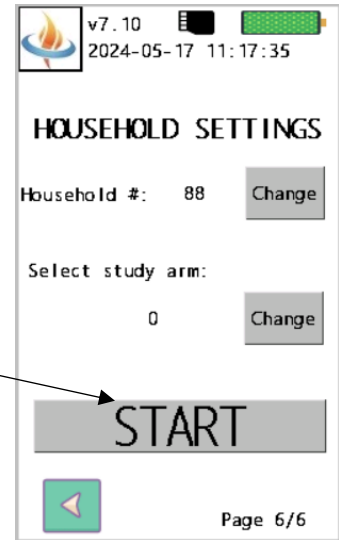
Select the logging rate. The mission time is automatically adjusted.



N.B: The “fast” mode is a special mode that is useful to do sensor placement testing. In this mode, the sensor will log the temperature every 4 seconds. It is then easy to see in real time how the placement of sensor influences the sensitivity of the temperature recorded. In this mode though, the internal memory will be full in a few days, so it is not very useful for long term deployment.

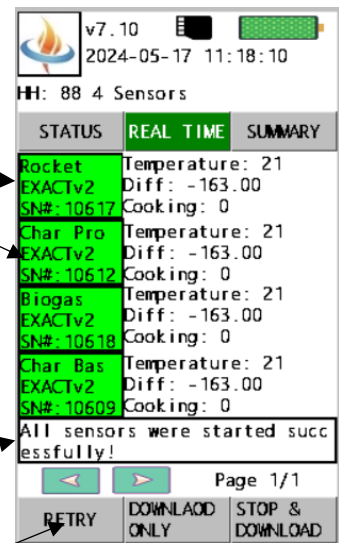
- Provide then the information for the household: household #, study arm. The Household ID can be any number between 1 and 65000. The Study arm can be any number between 0 and 7.

Press START when you are ready to start the sensors.



- After you press "START". You will receive a confirmation that each sensor has been started successfully (they turn green).

The name of the sensor turns green when it is successfully launched



If for some reason some sensors have not been started successfully, press the retry button until they have all succeeded.

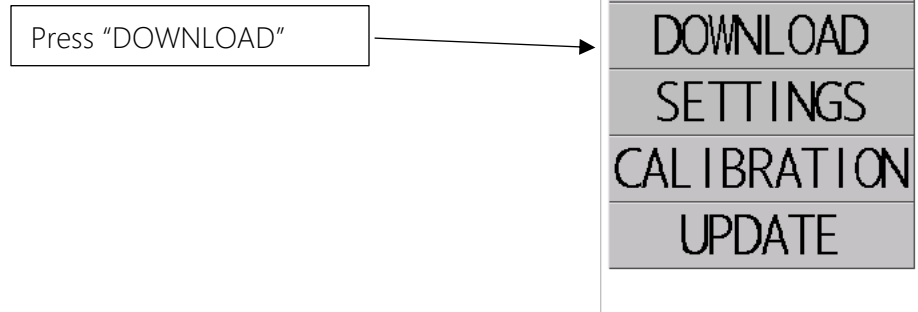
A summary of the action taken is displayed here

Press the "RETRY" button to execute again the latest action

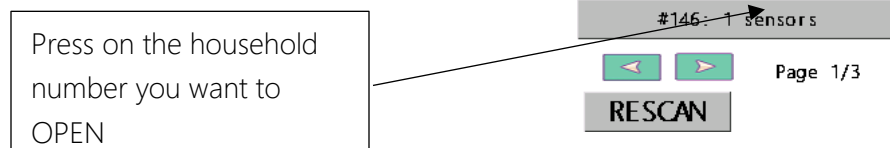
N.B: when you start a new mission, the sensor reset them-self and all the data from the previous mission is erased. So be sure to download the data you need from the sensor before you start a new mission.

DOWNLOAD DATA FROM THE SENSOR

- Make sure a SD card is inserted into the launcher
- Press the DOWNLOAD button

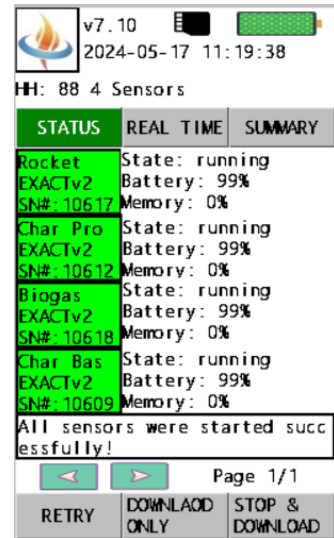


- After a 20 second scan the household numbers and number of sensors in each household will be displayed.
- If you don't find the household you are looking for or if the number of sensor inside the household is lower than it should be then make sure you are within range of the sensors and press "RESCAN"
- Choose the household number you want to OPEN.



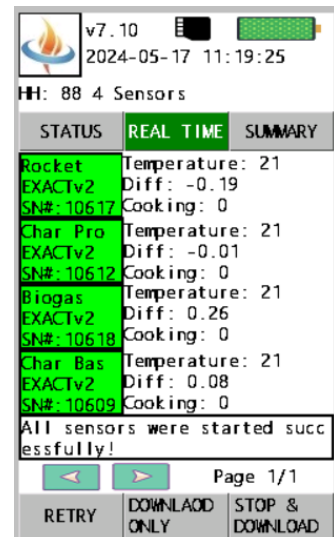
- You will see a summary of up to 20 sensors present in this household. At the top you have three options:

- STATUS: shows if the sensors are active or not and display their battery level and their memory level (a sensor automatically stops when its memory is full)



- REAL TIME: shows the current temperature and whether the sensors detect cooking or not.

N.B: the sensor always measures the difference between stove temperature and ambient temperature.



○ SUMMARY: shows a summary of the cooking event per day (except when the sensor has been running for less than one day in which case is display the total number of cooking event), the cooking time in minute per day (except if the sensor has been running for less than one day) and the day the stove was last used.



At the bottom, you have two options:

- DOWNLOAD ONLY if you want download the data but keep the sensors to running.
- STOP & DOWNLOAD if you want to download the data and stop the sensors as well.

When the box turns green that means that the sensor data has been downloaded successfully.

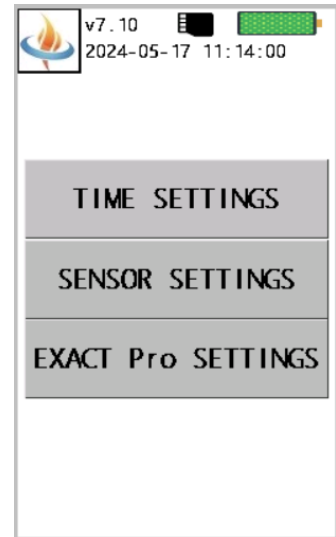
If some of the downloads have not been successful then press the RETRY button

Once the data from all the sensor have been downloaded, the launcher combine write their data onto the SDCARD, **please don't turn off the launcher during this operation.**

SETTINGS

You change the settings by pressing the "SETTINGS" button on the home screen.

You can then, choose between the "time settings" and the "EXACT Pro settings"

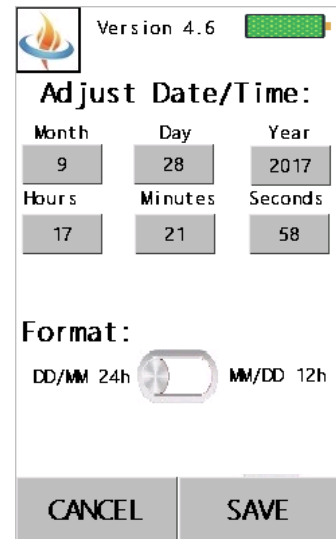


Time Settings:

Before using the launcher in a time zone, make sure that the local time has been set on the launchers. This will assure that the time stamps are accurate. The clock inside the launcher may drift so make sure to check it from time to time.

The timestamp may be displayed in MM/DD/YYYY 12H AM/PM or DD/MM/YYYY 24H format. Please choose the most convenient format for your needs.

N.B: Once the starting time has been sent to the sensor, it keeps a very accurate track of time. The time drift of the sensor should be less than 10 minutes per year.



EXACT Pro Settings

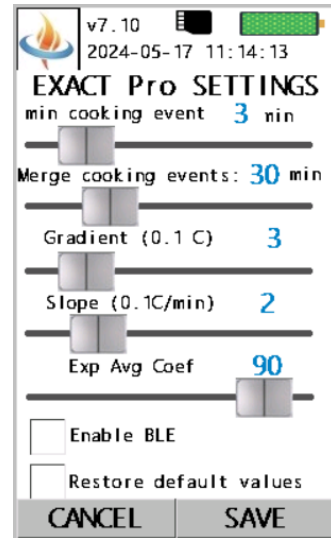
This screen allows you to change the parameter of the cooking detection algorithm that process data on the fly.

These parameters have fine-tuned to work by default with most stove type. Please change them only when needed for a specific stove type. You can find more details on our cooking event detection algorithm in a separate Annex.

You can also enable Bluetooth communication here. Once set, the sensor will be able to communicate with our app during an active mission only.

You can restore default value by checking the box at the bottom of the screen.

Once set those values are used for every EXACT Pro sensor.

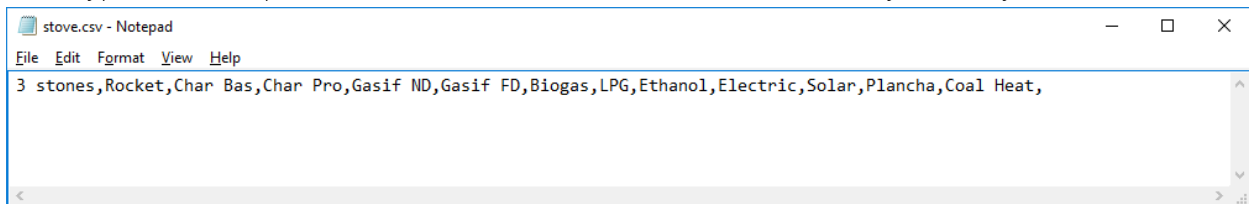


CHARGING THE LAUNCHER BATTERY.

The battery is recharged via the micro-USB port. In two hours the battery will be fully charged. The battery level is displayed on the top right corner of the screen when the device is powered. A fully charged battery last for about 10 hours of continuous use.

CHANGING THE STOVE LIST

A list of 16 different stove names is stored into the launcher. This list should be customized to your specific project area. The stove names allow to easily know on which stove the sensor has been placed. It also allows afterward to run interhousehold analysis and to automatically group data by stove type. So it is important that the stove names are consistent across your study.



The stove names are stored in a file on the SD card called "stove.csv". You can open this file in a text editor (like notepad, it is better to not use MS Word or Excel for that) and change the name of the stove. Each name is separated by a coma, don't add any space or carriage return (no need to press "enter"). The best way of assure consistent names is to edit one file and then to paste it onto the SD cards of all the launchers used in your study.

N.B: The stove names are limited to 8 characters.

N.B: It is important that you don't change the name of the file (stove.csv) so that the launcher will know to look in this file for the list of stove names.

ANNEX I: GUIDANCE ON SENSOR PLACEMENT

ANNEX II: COOKING EVENT DETECTION ALGORITHM

ANNEX III: EXPECTED SENSOR LIFETIME IN DIFFERENT MODE